

UNDP in Kazakhstan
Global Environment Facility
Ministry of Regional Development
of the Republic of Kazakhstan



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REMOVING BARRIERS TO ENERGY EFFICIENCY IN MUNICIPAL HEAT AND HOT WATER SUPPLY

*Accomplishments & lessons learned
from the UNDP/GEF project
in Kazakhstan*

Final publication

ASTANA - 2013

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O - **Removing Barriers to Energy Efficiency in Municipal Heat and Hot Water Supply: Accomplishments & Lessons Learned from the UNDP/GEF Project in Kazakhstan** - Astana, 2013 - 60 p.

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ISBN

Project "Removing barriers to energy efficiency in municipal heat and hot water supply" implemented by the Government of the Republic of Kazakhstan and United Nations Development Programme/Global Environment Facility has completed its activity. This Project aims to create and approbate mechanisms for investments leverage into sustainable and effective development of heat supply sector, to lay a foundation for progressive promotion of energy services taking into account both local and global environmental considerations. For period of 6 years the Project accumulated the invaluable experience on implementation of demonstrative initiatives in residential multi-apartments sector. The situation in the housing sector has changed. Amendments to the legislation were adopted. Energy service companies entered the market.

The final publication of the project contains the main achievements of the project which influenced the policy of energy efficiency in the country; lessons learned and recommendations for the future.

The publication is intended primarily for decision makers in the field of promotion of energy efficiency, will be useful to specialists and experts on energy saving.

The views expressed in this publication do not necessarily reflect those of UNDP.

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Abbreviations used in the text

AAO	Association of Apartment Owners
AREM	Agency of the Republic of Kazakhstan on Regulation of Natural Monopolies
ADS ZhKH	Agency of the Republic of Kazakhstan on Construction and Housing and Municipal Infrastructure
bln	billion
CHP	Combined Heat and Power (equivalent to co-generation)
DH	District Heating
EE	Energy efficiency
ESCO	Energy Service Company
Gcal	Gigacalories
GEF	Global Environment Facility
GHG	Greenhouse gas
HBO	Heat only boilers
MEP	Ministry of Environmental Protection
MINT	Ministry of Industries and New Technologies of Republic of Kazakhstan
NGO	Non-government organization
PMMHI	Program on Modernization of Municipal Housing and Infrastructure
TCE	Tonne of coal equivalent
UNDP	United Nations Development Programme
US \$	United States dollars

1. Executive summary

The UNDP/GEF Project “Removing barriers to energy efficiency in municipal heat and hot water supply” started in 2007 and ended in June 2013. It has been financed by the Global Environment Facility (GEF) and implemented by the United Nations Development Programme (UNDP) and the Government of Kazakhstan.¹



Key achievements and policy impact

The ultimate objective of the UNDP/GEF project was to increase energy efficiency in district heating and hot water supply by removing legal, institutional, financial, capacity and information related barriers. The project succeeded not only in delivering expected results but also in substantially influencing the country's policies and practices in energy efficiency.

Notable achievements and policy impacts from the project's advocacy and program interventions include:

- Successful lobbying for the new Energy Conservation and Efficiency Law adopted in January 2012. This new legislation provides a strong basis for improvements in the district heating sector. The new law, among other things, now targets the housing and communal sector, includes the concept of 'thermal upgrade', and defines responsibilities of government agencies in terms of design and implementation of energy-efficiency programs and plans.
- Inclusion of an energy-efficiency component into the national Program on Modernization of Housing and Municipal Infrastructure, with a total budget of US \$5.8 billion, of which US \$2.6 billion has already been allocated for 2011-2015 to retrofit residential buildings, including thermal upgrades. Energy efficiency makes up the major component of the Program, with about 40% (US \$48 million) already spent in the first quarter of 2013 for EE upgrades, generating about 30,000-40,000 tonnes of CO2 savings annually.²
- Demonstration of sizable social and economic benefits for Kazakhstan in the form of new jobs, alleviation of fuel poverty and greenhouse-gas emission reduction. Specifically, the UNDP-GEF project estimates that additional 1,625 green jobs per year can be created by the investment in EE retrofit of multifamily apartment buildings.
- A signed US \$0.7 million government agreement with UNDP on implementing a complex energy-efficiency program in a town of Prigorodnyi nearby Astana financed from the state budget.
- Adoption by the Ministry of Regional Development of the project's tested approaches to energy efficiency in district heating and hot water supply and their inclusion into a strategy for regional development that the Ministry is currently formulating. This will lead to the nationwide replication of the project's results.
- Successful promotion of a strategic and multi-tiered approach to outreach, education and training that leveraged a variety of partners and resources.

Such achievements are reflected by the overall Highly Satisfactory rating of the independent evaluation completed in May 2013.

¹ Please refer to Annex 2: Project one-pager that summarizes key project details

² Final Evaluation. UNDP/GEF Project “Removing barriers to energy efficiency in municipal heat and hot water supply”. May, 2013.

Lessons

The UNDP/GEF project generated a large number of best practices and lessons learned available for scale-up and replication at the national and local levels. By sharing key lessons, the UNDP/GEF project arms policymakers and implementers with a roadmap to more effective energy-efficiency policies in district heating and hot water supply.

Creating political will: Political commitment to energy efficiency from the top down has proven to be of utmost importance for the success of the completed UNDP/GEF project, and will be essential if the energy-efficiency agenda is to materialize and succeed further in Kazakhstan. By sending high-level speakers to the project's conferences and presentations of demonstration projects, by inviting the project to deliver talks on energy efficiency in the housing sector at the Government's meetings, and by using the project's analysis and findings for development



of the housing program, the government showed strong and high-level commitment to project implementation. The government needs to provide leadership in addressing energy efficiency in district heating and hot water supply through a series of low-cost, high-impact actions, thereby informing, engaging, and motivating other stakeholders.

A multi-tiered approach to lobbying for legal and policy changes: The UNDP/GEF project proved the effectiveness of a multi-tiered and multi-stakeholder approach in pushing the energy-efficiency agenda forward. Talks at high-level meetings, all-inclusive public hearings, participation in conferences and government meetings, engagement of parliament deputies and hand-in-hand work with the government administrator on adoption and enforcement of the energy-efficiency law, a study tour to Poland for key decision-makers in the government and members of Parliament – all these steps represent a non-exhaustive list of ways that the project influenced and shifted the focus of government policies.

A bottom-up approach to policymaking: The UNDP/GEF project piloted a comprehensive bottom-up approach to the development of regional energy-efficiency plans/programs that first considers priorities and expectations of different stakeholders related to energy efficiency and only then formulates a goal and objectives of the program/plan with clear indicators for tracking its implementation. This approach proved to be cost-effective and responsive to the needs on the ground.

There is no end to the need for capacity building: The UNDP/GEF project has witnessed an enormous need for systemic capacity building that should be an integral part of national and regional programs on energy efficiency.

Active and dedicated partners are critical for sustaining progress and results: The very existence of active and dedicated partners on the ground is half the battle in attaining the sustainability of proposed interventions and implementation of public policies. The project benefited heavily from committed and enthusiastic partners in the government, among private sector companies, AAOs³, NGOs and professionals. These partners already implement energy-efficiency projects on the ground and push for EE in their localities.

A new approach to information provision & awareness: The public's general environmental ignorance and low awareness of social and economic benefits of energy efficiency can constitute a major obstacle to widespread introduction of energy-efficient measures in Kazakhstan. The project introduced an easy-to-use infographic tool, which conveniently and effectively conveyed key messages and results of pilot projects, financial schemes piloted by the project, etc. in a clear and non-technical manner.

³ Associations of Apartment Owners (AAOs) in Kazakhstan are non-governmental organizations (NGOs). AAOs also are known as cooperatives of apartment owners. Homeowners delegate to the AAO the right to manage and maintain multi-apartment buildings and common areas.

Recommendations for moving forward

The successful implementation of the UNDP/GEF project has been a major step, but only the first, toward a more energy-efficient Kazakhstan. There are many others to follow. Key recommendations for moving forward include the following:

The biggest challenge for Kazakhstan's district heating policy has been that tariff revenue does not cover the full costs of district heating. This has made it difficult to attract private investments to modernize or even maintain district heating systems, thus perpetuating the sector's heavy reliance on subsidies from public budgets. To shift this financial burden to the private sector, the government should consider a phased approach to restructuring the tariff policy up to a level of full-cost recovery. This work should go hand-in-hand with the creation of relevant social support schemes to extend adequate support to low-income categories of the population. Of course, energy efficiency itself is an important way to reduce the energy cost burdens to be borne by the public.

As private companies are still reluctant to enter the energy services market due to high investment risk, the government should consider the creation of a municipal energy service company (ESCO), as an alternative. Testing this model will generate practical results and on-the-ground experience on ESCO creation and operations, which are lacking at the moment, which can be used for amending existing and formulating new policies to speed up private ESCO activities.

The Program on Modernization of Municipal and Housing Infrastructure represents a timely government effort but requires an adequate monitoring system to track its effectiveness and inform subsequent rounds of policy adjustments. Such a system should serve the purpose of creating a unified database of completed retrofit projects, including a menu of realized measures, costs, effectiveness and barriers addressed during implementation.

The Government of Kazakhstan would benefit from economies of scale by adopting a practice of municipal energy conservation planning following pilot examples of Astana, Karaganda and Pavlodar. Recommendations of the UNDP/GEF project on planning and execution of energy conservation plans will guide municipalities in this new endeavor.

Capacity building of AAOs and managing companies should be at the core of public policies in the housing sector. It is crucial that competent people manage communal property to ensure effective implementation of relevant government policies.

2. Implementation experience and milestones

2.1. The Project and Its Development Context

In Kazakhstan, the residential sector accounts for 13.5% of power and 24% of heat demand, thus being the third largest heat and electricity consumer in the country, after the energy and manufacturing sectors. On average, buildings in Kazakhstan consume two to three times more energy per square meter than buildings in northern countries of Western Europe. More than half of the GHG emissions from residential energy use in Kazakhstan arise from space heating. Domestic hot water and electricity each account for approximately one-fifth of residential sector emissions, with cooking and other uses making up the remaining share.



Most existing residential stock consists of multifamily apartment buildings connected to district heating (DH) from boiler houses or co-generation stations. District heating covers over 50% of the urban heating demand. There are 42 large DH systems connected to 40 large co-generation plants (CHPs) and 30 big central heat only boilers (HOBs). Total heat capacity of the CHPs constitutes 35,000 MW and their total power generation capacity 6,700 MW, or about 38% of all power generation capacity in Kazakhstan. Most CHPs are coal fired, while the HOBs are primarily using mazut as fuel.

Apart from using co-generation as a source of heat in some systems, the efficiency of the DH systems is otherwise low with heat losses reaching up to 50% of the primary energy used. The high level of heat losses is primarily due to old, obsolete equipment (typically of an age between 25 and 40 years) and inadequate maintenance⁴.

Considering a large energy-saving potential (about 30-35% of consumption levels) in the district heating sector of Kazakhstan, the project was designed to reduce greenhouse gas emissions resulting from the heat and hot water supply services and to lay the foundation for the sustainable development of this sector.

The following categories of key barriers to the sustainable development of heat and hot water supply services were identified during the development phase of the UNDP/GEF Project:

i. Legal, regulatory and policy related barriers:

- Inadequate financial incentives (such as low tariffs and non-payments) for DH companies to invest in improved energy efficiency of DH systems as set by the Law on Energy (1996), Law on Energy Saving (1997), National Energy Saving Policy (1996) and other related regulations;
- Outdated technical standards and regulations preventing the use of new, more efficient equipment and installation techniques;
- Lack of accurate information on actual heat consumption, losses, and volume supplied to consumers;
- Ineffective legal and regulatory provisions governing the operation of an Association of Apartment Owners (AAO), for example, in case of contracting heat and hot water service providers or applying for a loan;
- Inefficient social support schemes for protecting vulnerable groups if tariffs are to cover the full costs of district heating.

ii. Financial and related institutional barriers:

- Lack of experience of the financial sector coupled with a high level of perceived investment risks of energy efficiency projects in Kazakhstan, which lead to high expected rates of return, high interest rates, high collateral requirements and short payback periods of available commercial or semi-commercial financing sources;

⁴ For details, please refer to Annex 1: Brief overview of heating sector in Kazakhstan.

- Weak financial status and low creditworthiness of target consumer groups and existing DH companies;
 - Difficulties for private or semi-private DH companies in obtaining government or municipal guarantees required by most international “soft” loan providers;
 - Lack of or no experience in using new institutional and financial mechanisms and structures (e.g. Energy Service Companies (ESCOs), private-public partnerships, vendor credits, leasing) for developing, financing and implementing energy efficiency investments in both supply and demand side.
- iii. *Institutional and capacity related barriers:*
- Lack of local capacity to formulate and implement “bankable” energy efficiency project proposals;
 - Lack of experience and capacity to create and manage new institutional and financing structures and mechanisms such as ESCOs, Performance Contracts and private-public partnerships;
 - Lack of tradition and capacity among apartment owners in managing heat and hot water supply services, as well as other building related tasks and services (including investments into energy efficiency, when economically feasible) at the building level; and
 - Lack of general awareness and information of different stakeholder groups on available, cost-effective energy saving technologies and measures.

The project's long-term solution to addressing the above-mentioned barriers relied on three key elements:

- creating a supportive legal and regulatory framework to promote and provide incentives for improvement of the energy efficiency of the heat and hot water supply services in Kazakhstan;
- introducing new institutional and financing models to leverage financial resources for energy efficient investments and enhancing capacity of the local stakeholders to support implementation and replication of such models;
- compiling, analysing and disseminating the project experiences and lessons learnt, and initiating their effective replication in Kazakhstan and in other countries of the CIS region.

The following sections present the project's implementation activities and milestones in terms of how the project helped overcome identified barriers to the sustainable development of the district heating sector in Kazakhstan, including the project's major accomplishments, policy impact and lessons learned.

2.2. Legal and regulatory changes

The legal, regulatory and policy framework relevant for energy efficiency and conservation at the start of the project, including the Law on Energy (1996), Law on Energy Conservation (1997) and National Program on Energy Saving (1996), were rather declaratory and provided little effective incentive for energy efficiency among different stakeholder groups - municipalities, AAOs, heat supply companies, general public, etc.

The project took a multi-faceted approach to addressing identified barriers and gaps in legal, regulatory and policy frameworks.

First and foremost, the project focused on upgrading the Law on Energy Conservation. It not only drafted several advanced provisions on energy efficiency for the housing sector, but also pursued different tactics in advocating for energy efficiency agenda in the government and lobbying for adoption of a new and much improved version of the Energy Saving and Efficiency Law in the Parliament of Kazakhstan. The project experts had regular meetings, workshops and seminars with members of the Majilis⁵ of the Parliament of

⁵ The lower house of the Parliament of Kazakhstan

Kazakhstan and relevant government ministries and agencies to provide technical details of and justification for each proposal as well as more general information on the importance of tackling existing and future energy deficits, as well as other problems. The project elaborated energy efficiency policies and programs and associated targets. Moreover, the project provided an opportunity for stakeholders from outside the government (NGOs, AAOs, experts and the general public) to raise their concerns and provide constructive comments on the draft Law by organizing an all-inclusive public hearing. Interestingly, several government agencies adopted the project's format of a public hearing and used it in other lawmaking exercises for reaching out and hearing opinions of a wide range of stakeholders.



Alexander Belyi, UNDP/GEF Project Manager: «The UNDP/GEF project dealt with hands-on and straightforward stuff with real, visible positive effects on people's lives. We assisted the government in shaping its legal and institutional structures that are instrumental for design and deployment of energy-efficiency policies in the country».

Also, the project summarized experiences of Poland, Germany, Denmark, Australia and Canada in facing similar legal and policy-making problems in district heating. The project then compiled solutions and shared them with stakeholders in the government and Parliament.⁶ Study tours to Poland and Russia (Moscow) for government decision-makers and parliament members exposed these important stakeholder groups to first-hand experiences of practitioners and policy implementers in other countries and enabled them to see tangible results on the ground.

All these collective efforts were instrumental in building a critical mass of energy-efficiency promoters from within the regulatory and executive systems of Kazakhstan, resulting in successful adoption of the new Energy Saving and Efficiency Law in January 2012.⁷ The new law now includes the housing and communal sector as a separate section and the concept of 'thermal upgrade,' which were missing in its earlier revisions.



Speech of the UNDP/GEF Project Manager at the RoK Government Meeting. April 2011.

Thanks to the long-term and effective cooperation with the government, mainly with the Ministry of Regional Development, the project was able to substantially reshape the 2011-2020 National Program on Modernization of Municipal and Housing Infrastructure (PMMHI) by including a component on energy efficiency. Originally, the Program envisaged only renovation of structural elements such as roofs or facades, replacement of pipes and electric wiring, etc. Now, building-level energy-efficiency improvements are also eligible for financing. The Program's total budget for 2011-2020 amounts to US \$5.8 billion. One hundred twenty million US dollars have already been allocated to renovation of 1,200 multi-apartment buildings, of which about 40 percent, or US

\$48 million, is estimated to have been allocated for EE improvements, such as installation of building level-heat metering and heat exchangers with controls, reconstruction of roofs with new insulation, installation of new windows in hallways, and some building facade insulation.⁸

⁶ A list of project publications and expert reports that summarize experiences of other countries

⁷ The Law on Energy Saving and Energy Efficiency was adopted in January 13, 2012.

⁸ Final Evaluation of the UNDP/GEF Project "Removing barriers to energy efficiency in district heating and hot water supply", 2013.

National Program on Modernization of Municipal and Housing Infrastructure (PMMHI) for 2011-2020 was launched by the government in April 2011 with a total budget of 4.7 billion US\$⁹. The Program consists of two implementation phases: 2011-2015 and 2015-2020. PMMHI aims to (i) reduce the share of multifamily buildings requiring capital repairs from 32% to 22% by 2015; (ii) increase the satisfaction of the users of utility services. The Program provides for the design and adoption of measures to modernize utility infrastructure, creation of an optimal model for housing relations¹⁰, improved quality of utility services to population as well as financing mechanisms for capital and routine repairs in multifamily buildings. Funding for the Program comes from three sources: public and municipal funds, apartment owners' own resources and private funds. The program contains some mandatory requirements for the funds to be disbursed, i.e. repairs should include thermomodernization works (e.g. insulation of roofs, floors and facade of a building, installation of energy efficient windows in hallways, etc.) and installation of heat metering and heat exchangers with controls. The Program utilizes a mechanism of direct financial transfers from the republican budget to Oblast akimats, akimats of Almaty and Astana cities to be used for creation of specialized organizations (similar to ESCOs) using a PPP mechanism. Once established, these organizations can finance routine and capital repairs in residential buildings given that apartment owners contribute 3% (2013), 5% (2014) and 7% (2015) of total project costs. Apartment owners pay back remaining costs over the course of a contract concluded among apartment owners, managing company or AAO and the specialized organization. These funds can then be used by the specialized organization to refinance repairs in other multifamily apartment buildings.



Round Table Discussion of the Law
«On Energy saving». 2009.

Other highlights of project implementation include: (i) provision of technical expertise in the design and adoption of a comprehensive municipal energy-efficiency plan; (ii) preparation of amendments to the Law on Housing Relations along with public hearings, workshops and seminars to support the inclusion of proposed amendments; (iii) presenting results and lessons learned of pilot projects in residential buildings at a high-level government meeting on energy efficiency in the housing sector to inform and shape development of a national program on modernization of municipal

and housing infrastructure; (iv) review of and development of proposals for changes in the social support scheme, mainly related to partial reimbursement of retrofit costs to low-income families and individuals.

These regulatory, legal and policy changes represent a tremendous step forward for the country in terms of approaching the two pressing issues, i.e. the retrofit of worn-out secondary stock of residential buildings and the enhanced efficiency of heat supply and use in the residential sector.

The project's work on the Law on Housing Relations and rules of housing aid for low-income groups resulted in an opportunity for low-income families and individuals to access the government social support scheme and be reimbursed for up to 30 percent of retrofit costs, including thermal upgrade expenses.¹¹ While relevant for some fraction of residents,

⁹ Subject to annual adjustments and approval by the government

¹⁰ This includes piloting a new form of housing relations, i.e. a managing company as an alternative to AAOs

¹¹ (i) Rules of housing aid as approved by the government resolution #2314 as of December 30, 2009. (ii) Program on

the social value of this opportunity cannot be underestimated as it addresses the issue of social inequality, thus making the PMMHl more attractive to vulnerable groups of population in the country.

2.3. New financial and institutional models for energy-efficiency and related capacity building

While economic development has significantly expanded opportunities for public financing for municipal infrastructure rehabilitation in Kazakhstan, there remain a number of barriers to private-sector financing to complement the resources of the municipal and state budgets. These barriers can be grouped in two broad categories: (i) the absence of institutional and financial mechanisms for developing, financing and implementing energy-efficiency investments on both the supply and demand sides, and (ii) the lack of capacity among key stakeholder groups (private companies, apartment owners and associations of apartment owners, managing companies, municipalities, NGOs and general public) to design, implement and disseminate energy-efficiency measures in district heating. During implementation, the project has revealed another important barrier to maximizing the benefits of energy-efficiency upgrades: the absence of a monitoring tool to assess post-implementation effectiveness of realized EE measures. The originally identified gaps and the newly discovered one constituted the starting point for the project's target efforts and interventions under Component 2.



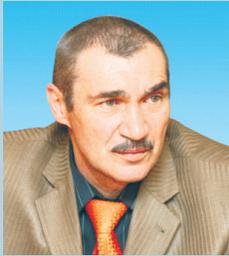
As background for the project's efforts to remove these barriers, two important points deserve attention, for they portray well initial implementation hurdles faced by the project. Originally, Almaty and Kokshetau were identified as pilot sites for testing new approaches to financing energy-efficiency measures. These sites offered advantages of location and climate diversity, as Almaty is in the south and Kokshetau is in the North. Moreover, the Ministry of Environment Protection (MEP), the project's implementing partner, was located in Kokshetau at that time.

By the actual start-up of the project, however, the situation changed drastically,¹² shifting the focus to Astana and Almaty as most relevant pilots for the project's intended activities on introducing and testing the ESCO mechanism, attraction of additional investments to increase energy efficiency in the municipal sector and to reduce GHG emissions associated with heat and hot-water supply. On top of that, the project shifted its primary focus from the district heating utility level (large-scale supply-side projects) to energy improvements at the building level (small-scale demand-side projects).

The project invested substantial time, effort, and financial resources in demonstrating the workability of three different revolving financial arrangements in 17 pilot projects in residential and municipal buildings in Almaty, Astana and Karaganda.

Modernization of Municipal and Housing Infrastructure for 2011-2020.

¹² The major changes included: (i) a private district heating utility in Kokshetau – the project's expected key partner for the Kokshetau pilot – went bankrupt before the actual start of the project; (ii) new developments in legal and institutional frameworks related to energy efficiency, mainly the approved Sustainable Development Concept that prioritized energy efficiency issues for the country; (iii) Astana became a construction boom area, which made the issue of energy efficiency very important for Astana given high winter and summer temperature fluctuations; (iv) the presence of the government made Astana particularly suitable for an 'energy-efficiency testing ground' whereby realized measures could be showcased to local governments from regions as well as to other stakeholders for scale-up and replication, and information sharing.



Vasily Maslov, National Director of the UNDP/GEF Project, Ministry of Regional Development of Kazakhstan: «I would highlight the experience of the UNDP/GEF pilot projects at the building level, which tested various approaches to financing energy-efficiency measures, including revolving mechanisms. With development of the energy services market in Kazakhstan, these tested approaches represent readily available financing schemes that could be easily adapted to the needs of different stakeholders».

Under the private ESCO model in Karaganda, a private company Ergonomika that specializes in heat energy conservation in multi-family apartments and public buildings took the responsibility for organizing and managing the funding.¹³ It was the AAO's job to realize and document savings produced by the energy efficiency measures during the contract period and repay the ESCO company for provided energy-efficiency services. Ergonomika then reinvested the accumulated savings to other EE measures.

The scheme of the ESCO business model is in the sector of district heating residential consumers

ESCO invests its own funds into upgrading heating units for energy conservation purposes, concludes performance contracts with a Cooperative of Apartment Owners (management company) on return of the project.

Under this model, the KaragandyZhylusbyt company exists for payments collection based on heat meter readings. CAO covers all other billing functions related to heat savings, calculation and payment collection for energy services, and the transfer of payments to ESCO.

5 projects have been implemented on given model in residential buildings, which were constructed in different years in Karagandy city.

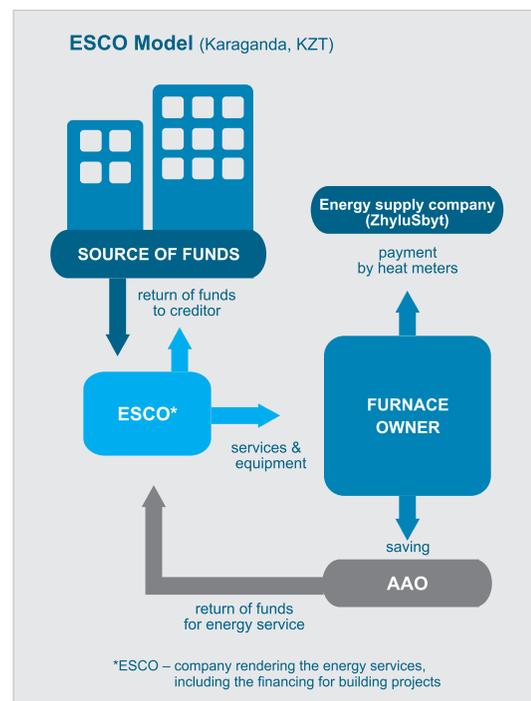


Figure 1. ESCO Model in Karaganda (an infographic sheet presenting key elements of this model)

Implementation of this pilot model generated invaluable experience for the UNDP/GEF project and the government related to engagement of the private sector via a performance contract in planning and execution of energy-efficiency measures at the building level. The private ESCO implemented five pilot projects that generated average energy savings of 10 to 35 percent in older building stock. The project summarized key barriers to ESCO operations as well as steps and documents needed for the establishment and management of ESCOs

¹³ GEF grant financing along with Ergonomika's own funds



Modernized Thermal Unit of a Multi-Apartment House. Local Fired Point in Karaganda

in Kazakhstan. This information appeared in a number of publications¹⁴ that were widely disseminated at meetings and seminars with potentially interested companies from other regions of Kazakhstan, including Kostanay and Pavlodar.

Apart from improved heating conditions in apartments, the project addressed the issue of intermittent hot water supply at one of its pilots (26 Mustafina Street) in Karaganda by installing a local hot water tank that accumulates water during off-peak hours and can deliver it to residents regardless of any disruptions in the hot water supply system. This realized measure generated important additional social and energy-saving values: (i) residents of the Mustafina Street building now have reliable 24/7 access to hot water, especially during summer season when heating and hot water pipelines are on repairs, and (ii) no need to purchase and install individual boilers, which are not as energy-efficient, nor as cost-effective. For details on key results of pilot projects in Karaganda, please refer to Annex 4.



Saule Akhmetova, Head of Chingiz AAO in Karaganda: «Within the PMMHI, we installed hot water meters and then an automated district heat exchanger in the building. We used generated savings for the next round of energy-efficiency retrofits. Initially, apartment owners were rather skeptical about the potential effectiveness of proposed energy-efficiency measures. This attitude changed with time as people noticed lower heating bills. And the behavior of apartment owners is changing: they become more aware of real benefits of energy conservation».

In the Astana model, apartment owners paid separately to the energy supply company, Energosbyt, for heating services, and to a contractor, through the AAO, for EE services with savings accumulated in a special energy-efficiency fund, i.e. a separate bank account. In particular, the AAO Ainur managed the energy-efficiency fund that accumulated savings from the realized measures, usually about 700-1,500 tenge from each apartment per heating season. The savings were then used for installation of energy-efficient lamps and sensors in hallways and partial financing of major repairs of pipelines in building basements. For details on key results of pilot projects in Astana, please refer to Annex 5.

¹⁴ A list of ESCO-related publications include but not limited to: (i) A case study: Conditions for ESCO development for energy efficiency improvement of municipal heat and hot water supply in Kazakhstan (2012); (ii) A case study: ESCO as an instrument for enhancing energy efficiency (2011); (iii) an infographic sheet presenting key elements of the private ESCO model; (iv) numerous articles in national and regional mass media, and in professional literature.

Energy efficiency demonstration zone in Astana city

models' testing:

- "Separate billing for the energy services"
- "Energy Efficiency Program"

UNDP / GEF model "Separate billing for the energy and energy services"

In this model, energy efficiency measures are undertaken out of proceeds of credit (loans) obtained by the condominium management authority (AAO or management company), and the return on investment is obtained from target fees received from apartment owners, including savings realized from energy efficiency (it can be accumulated in a specially created energy saving fund). After obtaining the loan, AAO (or management company) hires a contractor on a competitive basis who energy efficiency measures as specified in the project. After completion of the project AAO alone or in cooperation with a contractor calculates achieved savings and sets monthly payments that sent to the borrower through the Energy Saving Fund. After project completion, payments for the heat consumed go from individual accounts of apartment owners to Energosbyt.

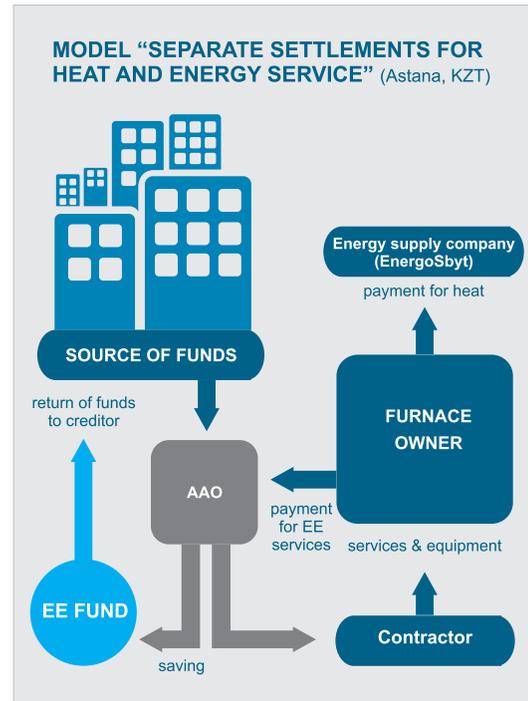


Figure 2. Separate Payments Model in Astana (an infographic sheet presenting key elements of this model)



Opening of Pilot Site – School #9
– after modernization of the heat
consumption system

In addition to residential buildings, the UNDP/GEF project – jointly with the Danfoss company – piloted approaches to energy efficiency and conservation in public buildings, mainly in two schools (School-lyceum #9 and School #15) in Astana. Despite visible positive effects of energy efficiency measures – including energy savings up to 31 percent, resulting lower energy bills, an increase in temperature in classrooms and a more even temperature distribution across classrooms – the cash savings accumulated in a general public fund accessible by other schools, and therefore were not specifically set aside for reinvestment in further energy-efficiency upgrades. The UNDP/GEF project identified and analyzed this barrier to energy efficiency in public buildings and summarized its recommendations for the use in development of municipal energy saving plans for Astana, Karaganda and Pavlodar.

In Almaty, the project tested a "one-stop" approach to financing energy efficiency measures: all payments from apartment owners went through the AAO, which in turn concluded separate contracts with a heat supply



Demonstration of the pilot site to
Government Delegation in Almaty

company and a contractor for the provision of energy efficiency services and equipment. Generated savings were then used for reinvestment in energy efficiency and conservation measures.

Energy efficiency demonstration zone: Almaty city: Testing of model «All settlements trough AAO»

In 2008 the Memorandum of Cooperation between UNDP and Almaty Akimat on energy saving action in heat supply was signed. The model «All settlements trough AAO» for Almaty was developed and tested. In 2001-2013 a demonstration pilot project with this model was implemented in residential multiapartment. Series of awareness-raising training events were conducted with involvement of different interested sides on energy efficiency measures promotion on the consumers’

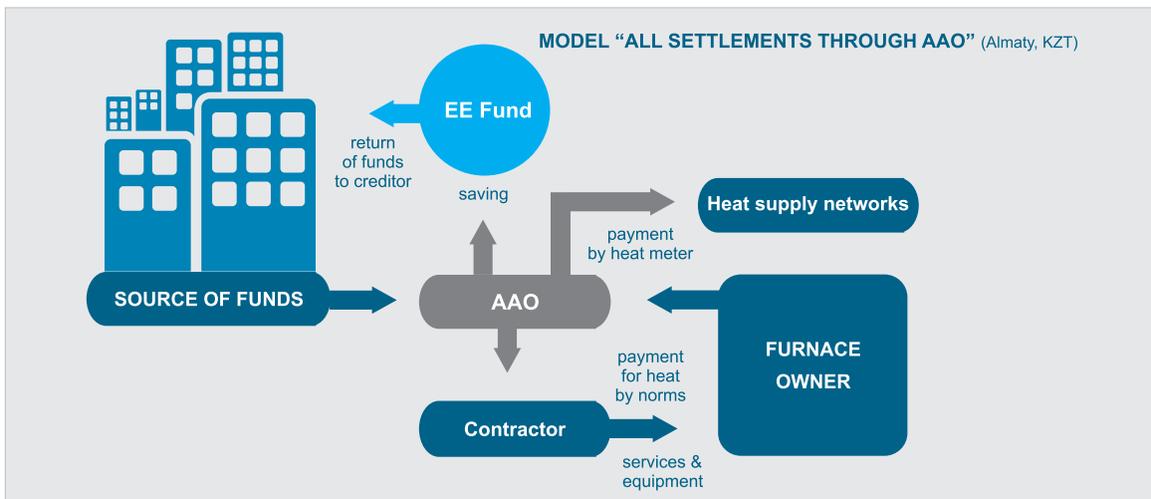


Figure 3. One-Stop Model in Almaty (an infographic sheet presenting key elements of this model)

Pilot projects have been executed in close cooperation with target municipalities, district-heating utilities, AAOs, building maintenance companies and the private ESCO in Karaganda. Also, the project designed a monitoring protocol that can set a formal framework for tracking effectiveness of EE measures implemented in residential and municipal buildings within the PMMHI. Despite their small scale, all the pilots generated important lessons learned and local experiences that the government used for the design of PMMHI.



Natalya Druz, national expert, UNDP/GEF Project: «Energy conservation has a female face as more dedicated and intelligent women become engaged in energy-efficiency activities – whether in a government institution, a non-profit organization, a private company or a household».

In the course of project implementation, gender dimensions of energy efficiency became clearly visible. Women serving as heads of pilot AAOs and schools decisively took the lead in implementation of pilot projects. If not for the enthusiasm and active engagement of these women, the success of demonstrating various approaches to financing energy efficiency in residential buildings could be questionable. Also, a social survey commissioned by the UNDP/GEF project concluded that women manage and make decisions on utility bills in about 70 percent of surveyed households. In public institutions (schools, hospitals, offices, etc.), women are often in charge of energy efficiency or reduction in energy consumption.¹⁵ As such, gender dimensions should be well considered during design and execution of energy-efficiency policies as more dedicated and capable women become interested in energy conservation and efficiency issues.



«Energy Efficiency in a Woman's Face»



Summer School for Condominium Management Body. June 2010.

Capacity building and training of target stakeholders for the pilot projects were at the core of project activities as the project aimed to generate enough local expertise and knowledge for the design and implementation of energy-efficiency projects by public institutions and private companies. Overall, the project trained 700 AAOs, 12 heat and hot water supply companies, over 25 local governments, and over 5,000 end-users of heat energy. Among numerous capacity building events conducted by the project, the following can be singled out: (i) a summer school for AAOs in

2010 and 2012; (ii) training for target groups in regions organized jointly with the Kazakhstan Center for Modernization and Development of Housing and Municipal Infrastructure; (iii) trainings in regions for potential ESCOs; and (iv) a continuing education course on energy efficiency in heat supply and use that was piloted in energy efficiency and knowledge sharing centers in Astana, Pavlodar and Kostanay in 2012-2013.

An important milestone in project implementation relates to a detailed assessment of the Kostanay's district heating system, including the possibility of heat tariffs that could fully cover the costs of the district heating services for Kostanay district heating company (KTEK) to invest in rehabilitation and improved energy efficiency of the municipal district heating. Following a feasibility assessment of technical and economic dimensions of KTEK, the project proposed a win-win solution that focuses solely on technical improvements on the supply side. Expected benefits included high production reliability, high quality of the heat and hot water services at reasonable tariffs, and, in general, a more efficient system that can protect customers against rising gas prices. The proposed components could serve as a pilot project example of market-based approaches to running a municipal heat and power company and can be widely replicated in the country.¹⁶



Consultations with Danish Experts in Kostanay. January 2013.

Finally, the project worked with Astana, Karaganda and Pavlodar akimats to develop regional/municipal energy saving plans, a concept of energy management and a methodology for energy auditing in the public sector. Model energy saving plans build on results of the two pilot projects in public schools by focusing on identified barriers to energy

¹⁵ N. Druz. Energy efficiency has a female face. Improving energy efficiency in heat supply. Quarterly bulletin. 1 (9) 2012, pp.22-23. UNDP/GEF Project "Removing barriers to energy efficiency in heat and hot water supply".

¹⁶ Final Report. Feasibility Study Report on the municipal heat supply in Kostanay City, Kazakhstan, 2012. Commissioned by the UNDP/GEF Project "Removing barriers to energy efficiency in heat and hot water supply". Executed by F. Pitzner-Jørgensen, P. Fafner, Ramboll.

efficiency in the public sector, and include measures for upscaling results on the UNDP/GEF pilot projects. The Astana energy saving plan for 2013-2015 was approved by the Ministry of Industries and New Technologies and is being implemented.¹⁷

2.3. Collection, analysis and dissemination of project results and lessons learned

The lack of general awareness of different stakeholder groups and non-existence of information on available, cost-effective energy saving technologies and measures served initially as an entry point for the UNDP/GEF project under this component. It was expanded later by including barriers related to (a) limited skills among key stakeholders in analyzing and summarizing experiences and results of realized energy-efficiency measures in district heating, and (b) poor outreach skills among relevant government agencies and mass media in popularizing the energy efficiency idea.



One of the Seminars for Target Groups. Almaty 2009.

Under the third component, numerous information dissemination and training activities have been carried out, targeting municipalities, AAOs, regional governments, private service companies, mass media, energy consumers and expert audiences. Overall, 500+ AAOs, dozens municipalities, 100 energy specialists received training on effective energy-efficiency policies and plans, design and implementation of energy-efficiency measures at a building level, cost-benefit analysis of EE upgrades, how to formulate and convey to a general public the idea of energy efficiency, key messages of the national/regional energy-efficiency program, etc. The project trained and strengthened capacity of governmental agencies, municipalities, AAOs, and private building service and energy service companies, all of which gained sufficient expertise and are now dedicated to energy efficiency and work on EE issues within their own budgets.

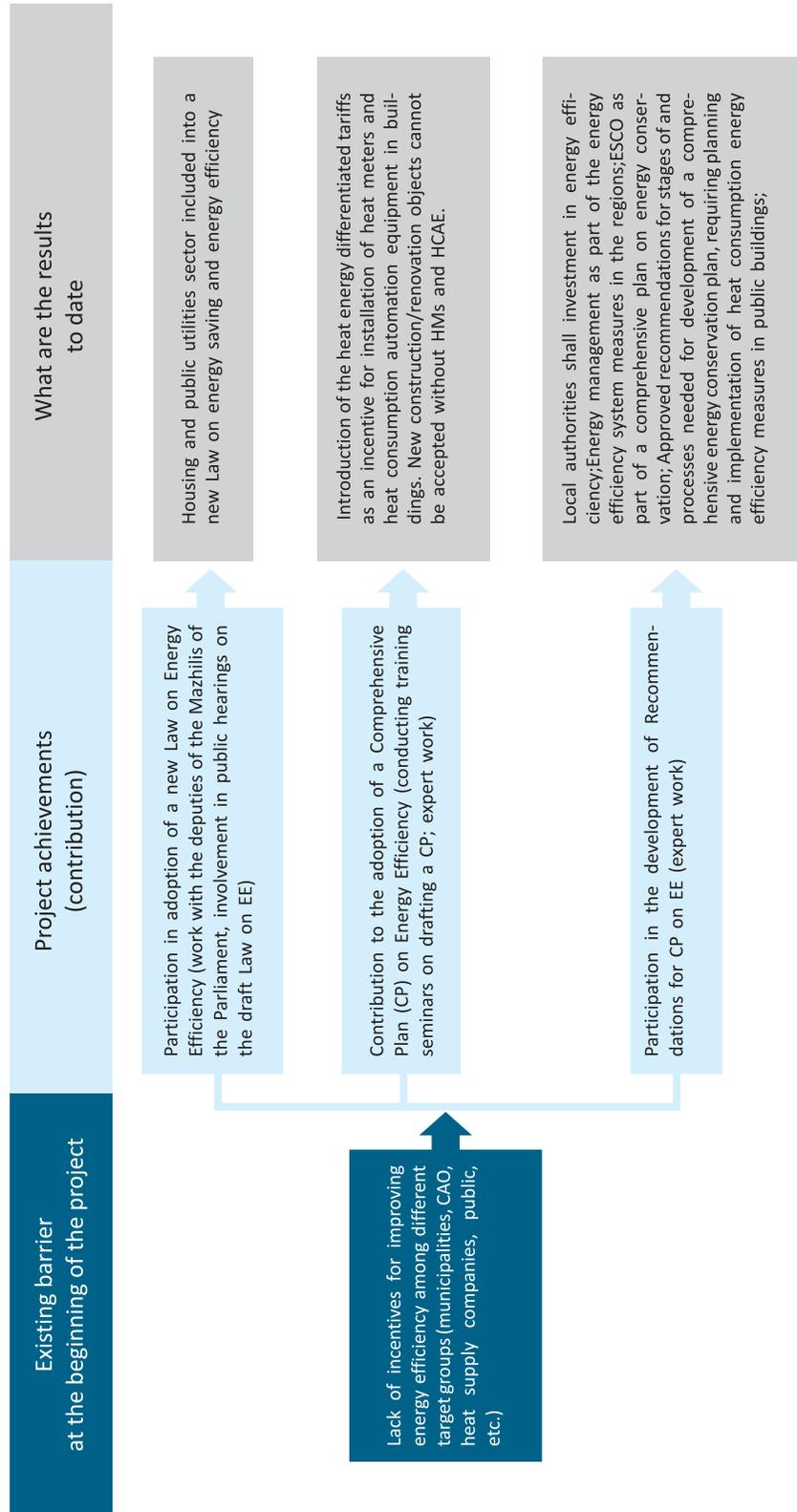
Notably, the project produced over 30 various informational publications on energy efficiency and conservation issues in district heating. It piloted the use of information graphics as a way to present complex information quickly and clearly. On a quarterly basis, the project issued an information bulletin "Enhancing efficiency in district heating" that reported on key results of the project, presented views of different stakeholders, summarized experiences in other countries, etc.

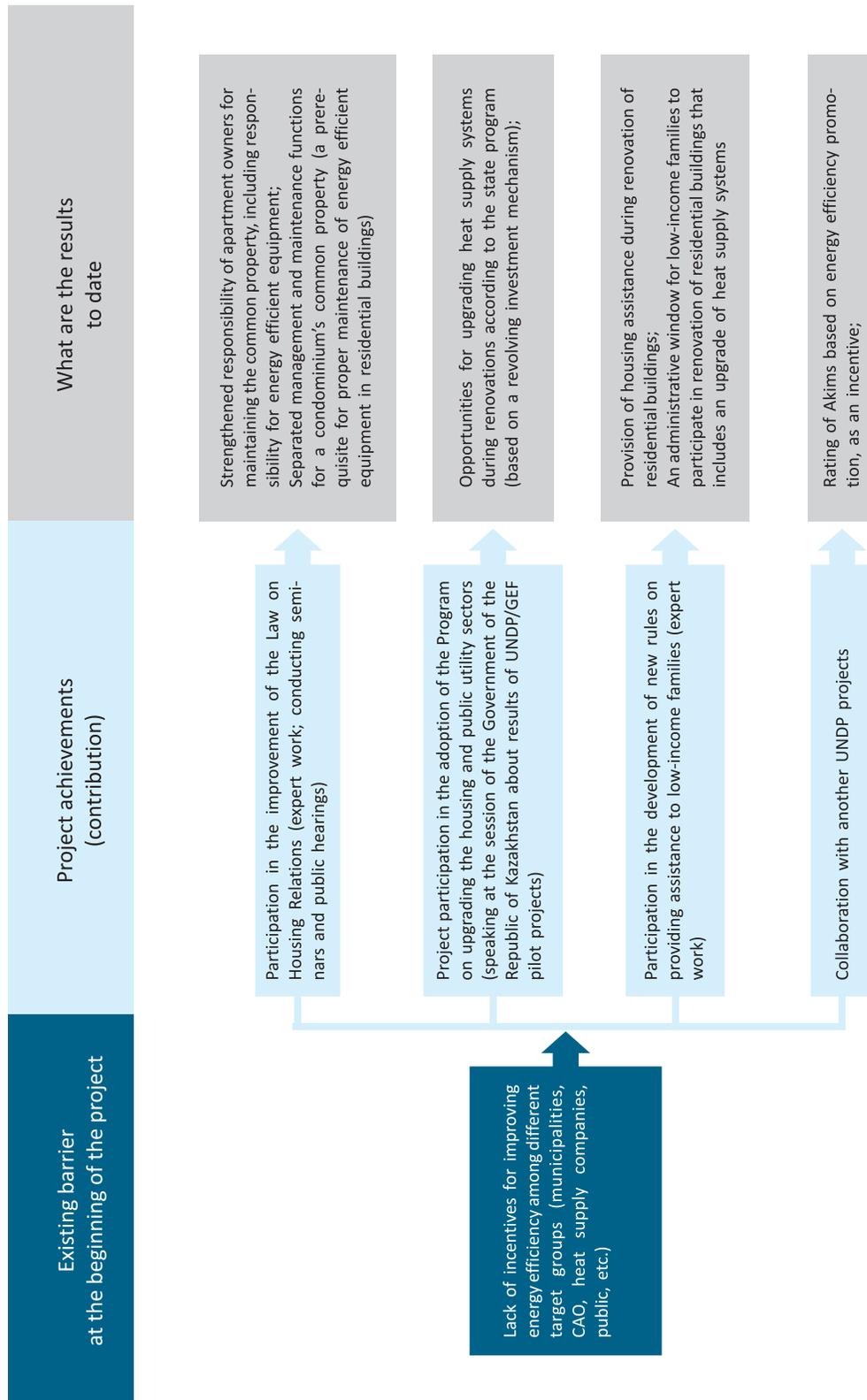
Since 2009, the state-owned "Kazakhstan Center for Modernization and Development of Housing and Municipal Infrastructure" has been the key project partner not only on information provision and dissemination but also for training activities.

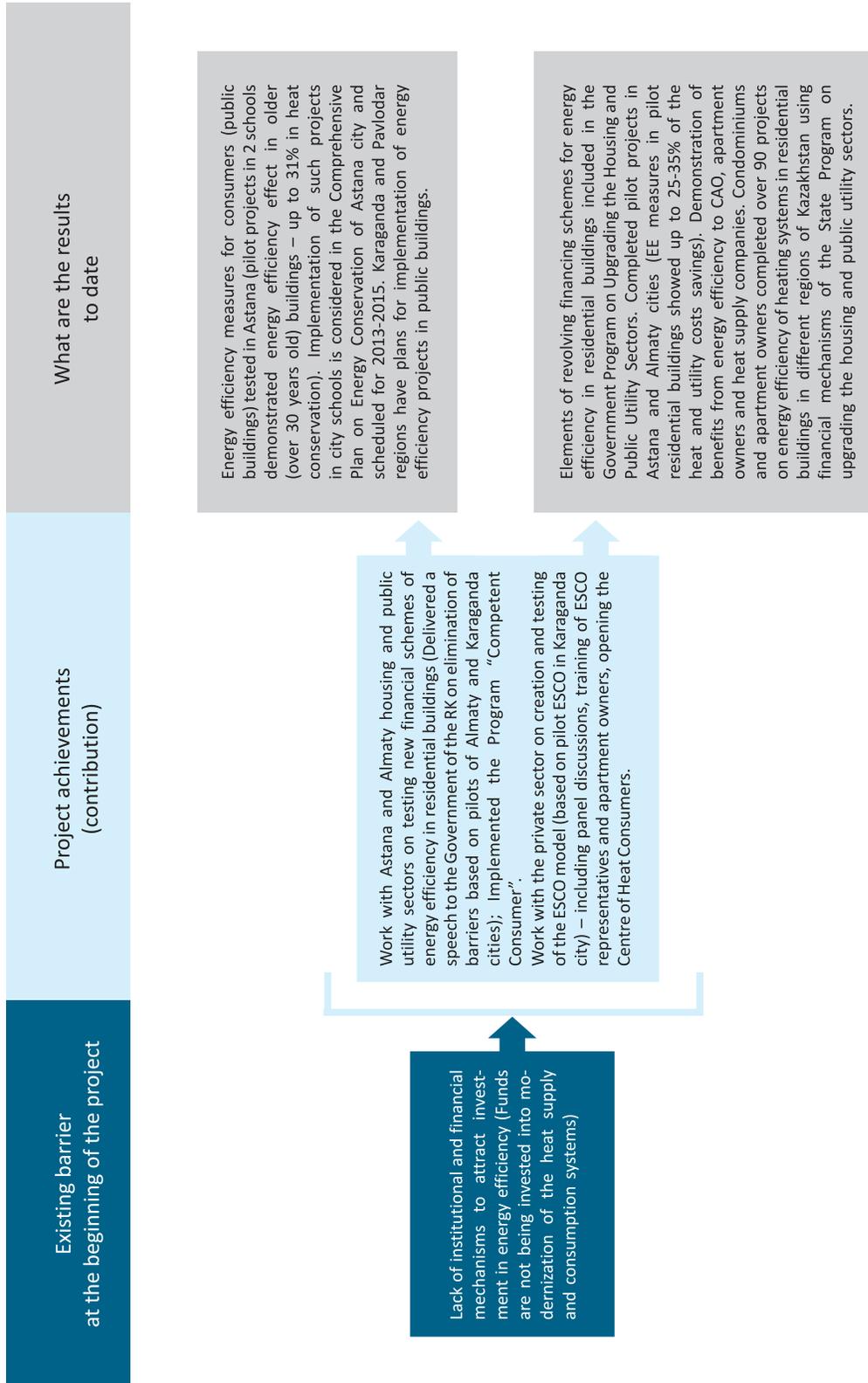
To add at the end of this section: Figure 5. Project actions aimed at overcoming barriers to energy efficiency in district heating and hot water supply (from the conference guide)

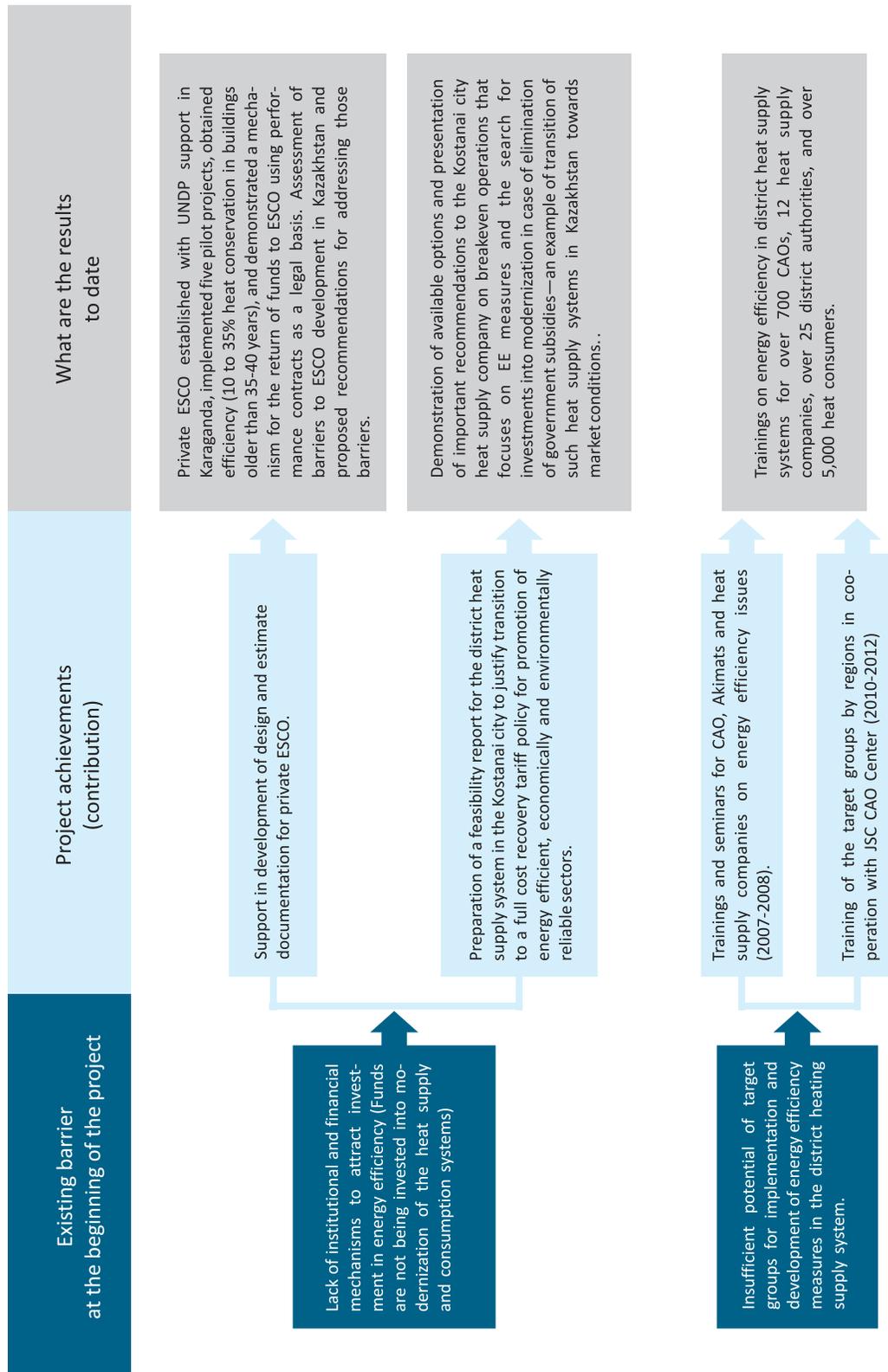
¹⁷ A case study: Regional energy saving planning, 2011. UNDP/GEF Project "Removing barriers to energy efficiency in heat and hot water supply".

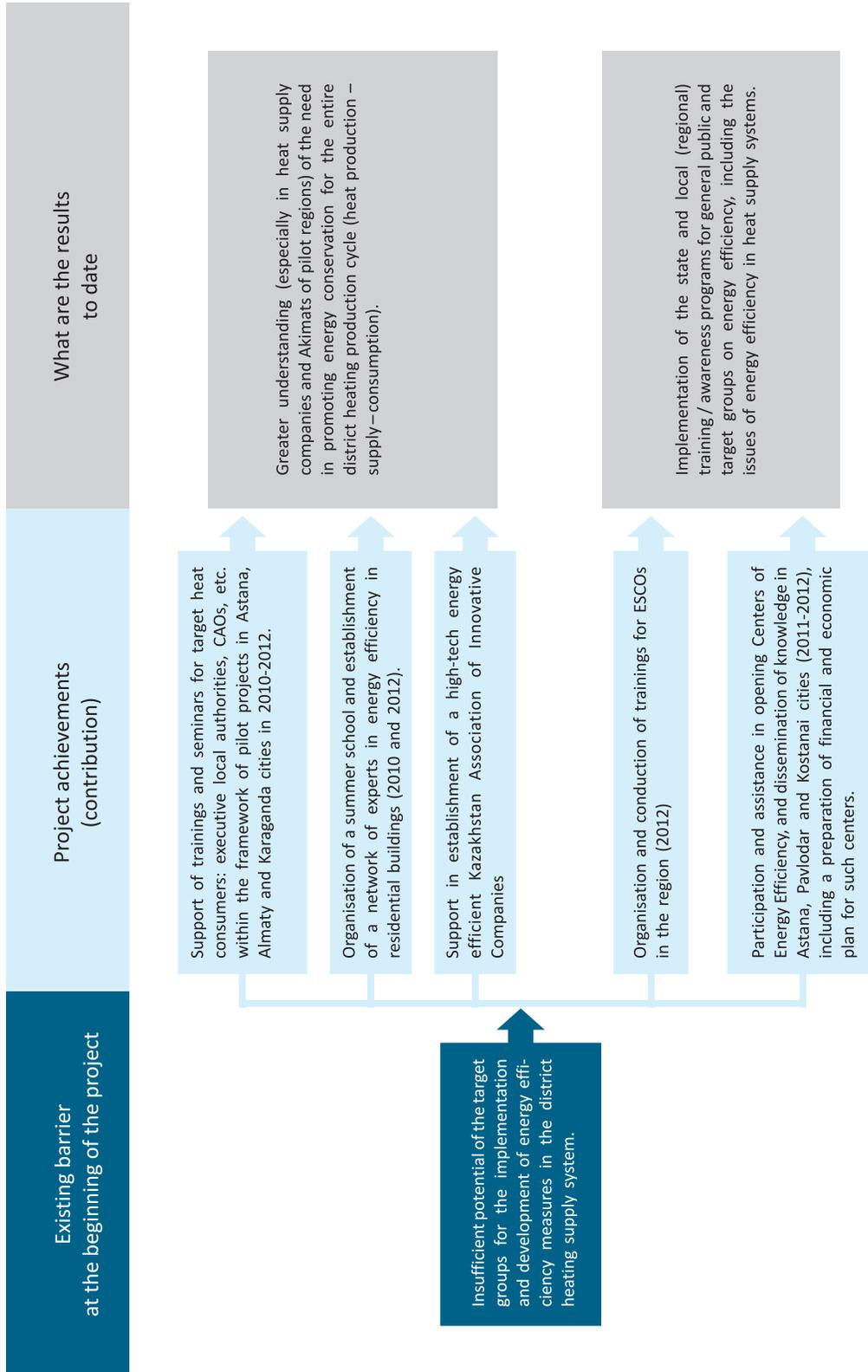
The project scheme, aimed at overcoming barriers of promoting energy efficiency in the district heat supply sector in Kazakhstan

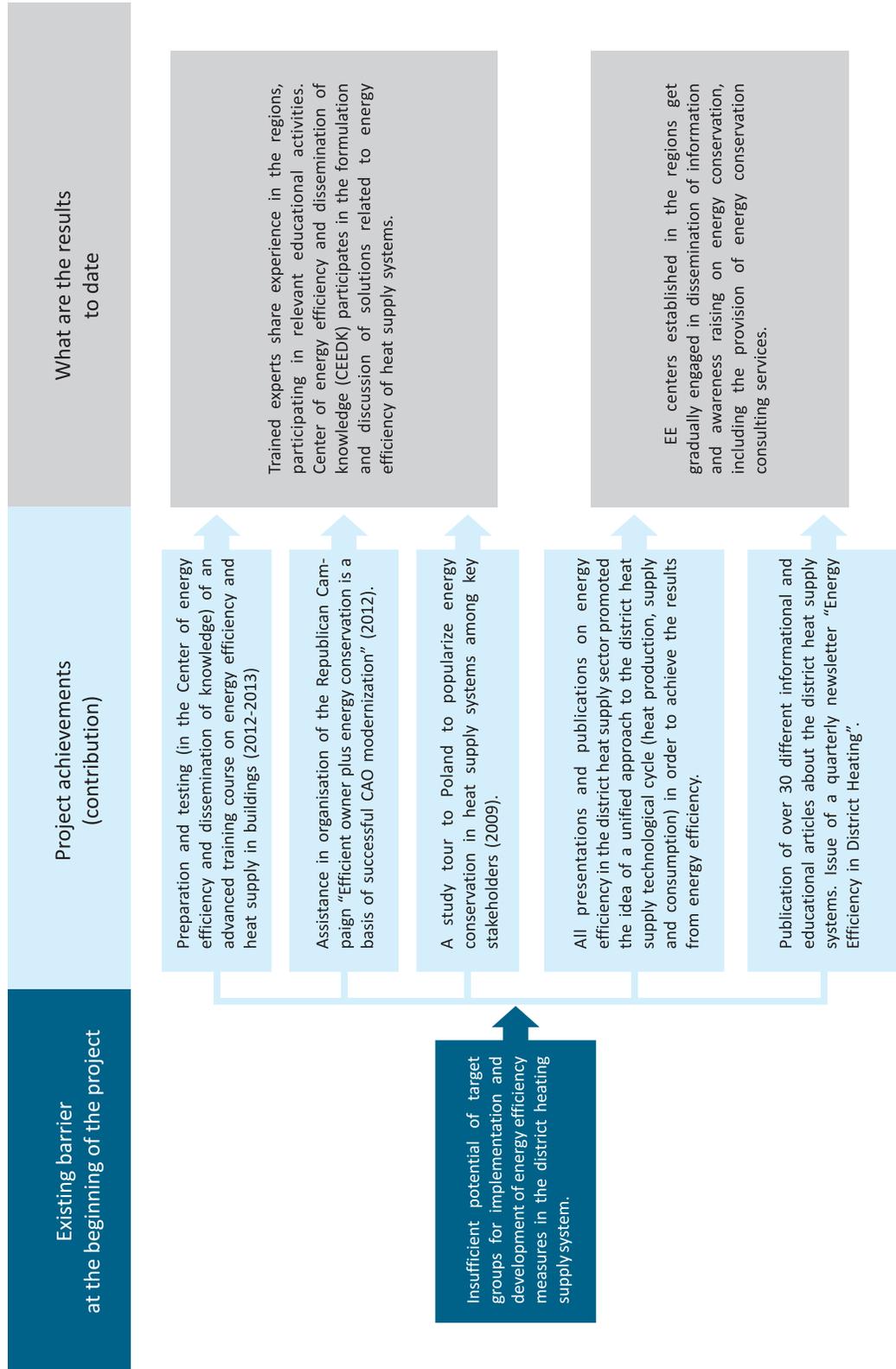












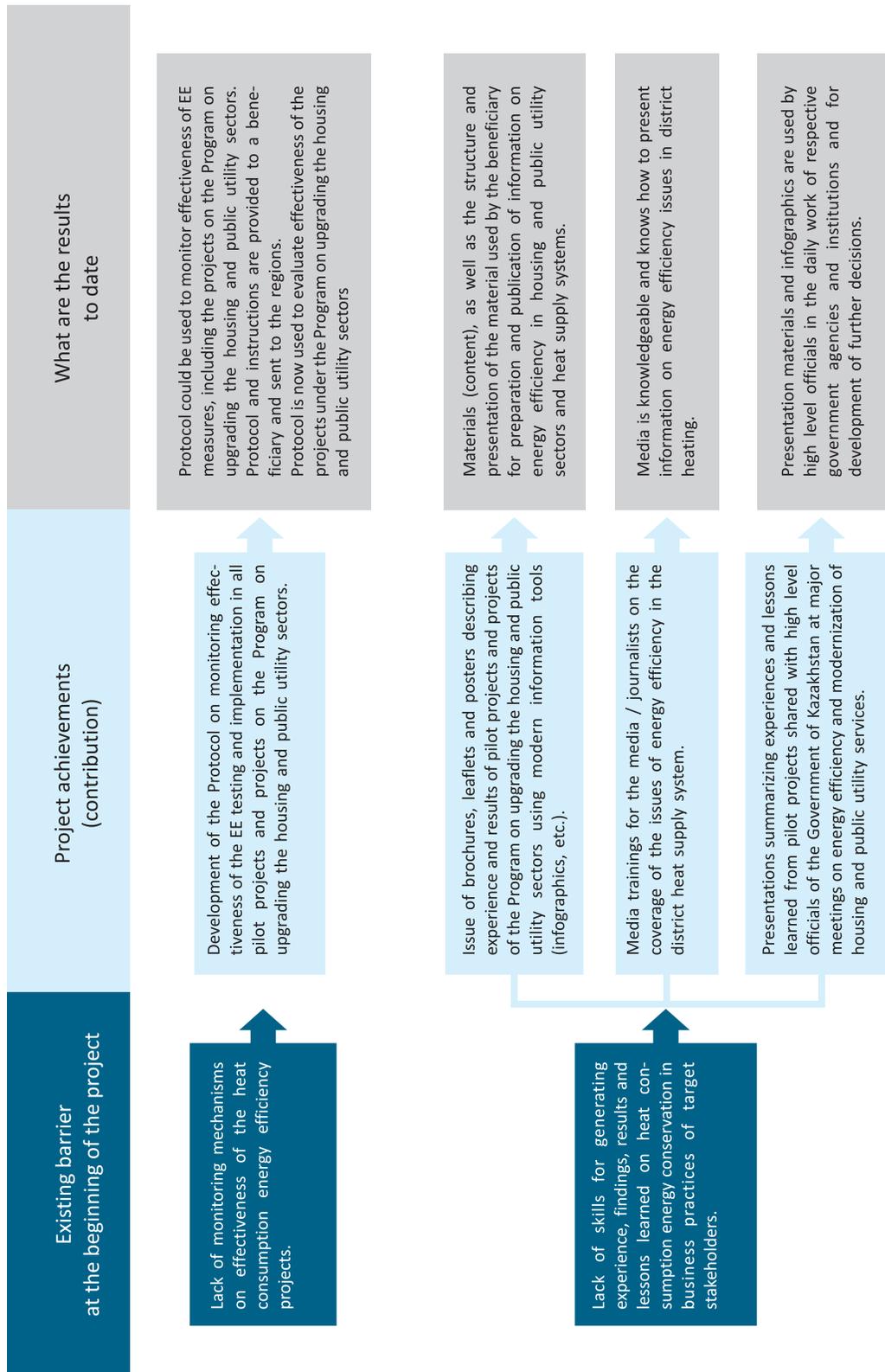


Figure 4. Key project publications (images of key publications & outreach products)

3. Key achievements & policy impact

The ultimate objective of this UNDP/GEF project was to increase energy efficiency in district heating and hot water supply by removing legal and institutional, financial, capacity and information-related barriers. The project succeeded not only in delivering expected results but also in substantially influencing the country's policies and practices in energy efficiency.



Kairbek Uskambaev, First Vice-Minister of Regional Development: «The UNDP/GEF project created quite a solid foundation that the government can build on in its ongoing efforts to reform and modernize the housing and residential sector».

One of the project's major achievements was successful lobbying for the new Energy Conservation and Efficiency Law, culminating in its enactment in January 2012. The new law – although not without weaknesses – sets a much better legal framework for dealing with energy-efficiency issues than its predecessor, the 1997 Law. Thanks to the project's persistent efforts, the new law now targets the housing and communal sector, includes a concept of 'thermal upgrade', defines responsibilities of government agencies in terms of design and implementation of EE programs and plans, etc.

Another worthy project success was the inclusion of an energy-efficiency component into the national Program on Modernization of Housing and Municipal Infrastructure, with a total budget of US \$5.8 billion, of which US \$2.6 billion has already been allocated for 2011-2015 to retrofit residential buildings, including thermal upgrades. Energy efficiency makes up the major component of the Program, with about 40% (US \$48 million) already spent in the first quarter of 2013 for EE upgrades, generating about 30,000-40,000 tonnes of CO₂ savings annually. If not for the project's timely and target interventions, the National Program would have focused solely on reconstruction/renovation of existing residential buildings without any energy efficiency retrofits in mind.



The International Round Table on Energy Efficiency. Astana 2009.



Sergey Poleschuk, Director of Ergonomika Company and first private ESCO in Karaganda: «Had the project not pushed for and tested new approaches to energy efficiency at the building level, for example, the government wouldn't have had a pool of locally generated experiences and results that are relevant to the country's legal, institutional and policy context, and thus feasible and readily available for replication».



Basic publication of the Project

The UNDP-GEF project demonstrated that apart from significant heat saving potential (i.e. energy savings of up to 50 percent were achieved), energy efficiency can bring sizable social and economic benefits for Kazakhstan in the form of new jobs, alleviation of fuel poverty, and greenhouse gas emission reduction. Specifically, the UNDP-GEF project estimated that additional 1.5 jobs per year can be created by the investment in EE retrofit of one multifamily apartment building.¹⁸

A monitoring protocol designed by the project sets a formal framework for tracking effectiveness of EE measures implemented in residential and municipal buildings, including GHG emissions reduction. This monitoring tool was tested in pilot projects and can now be used by the Ministry of Regional Development to monitor effectiveness of PMMHI.

As noted by many project partners and stakeholders – Ministry of Industry and New Technologies, Ministry of Environmental Protection, Ministry of Regional Development, Kazakhstan Center for Modernization and Development of Housing and Municipal Infrastructure, and AAOs – effective capacity building and training of local state agencies, municipalities, private companies and AAOs has been an important undertaking and accomplishment of the project. Now, thanks to the project team, there are already a number of dedicated and enthusiastic local entities on the market with requisite capacities and skills that are implementing EE projects on the ground. The Ergonomika Company, the first private ESCO in Karaganda, is in the lead.

Natalya Druz, Social expert of the UNDP/GEF Project: «There is a need for a transformational shift in the mindset of apartment owners. They should realize that an apartment is just a small building block of a much bigger and complicated organism called “communal property”. If all systems of this complex mechanism function well, then each apartment owner only benefits».

¹⁸ Retrofitting buildings directly increases employment because without an attempt to make the building more efficient, the work would not have been done. The investment/job creation ration for Kazakhstan is comparable with similar estimates made for the US economy, where stimulus package worth 100 bln US\$ is projected to result in additional 1,085,300 job-years. Green jobs and energy efficiency building retrofit in Kazakhstan. UNDP/GEF Project on Removing barriers to energy efficiency in heat and hot water supply. 2011.

Moreover, the government signed an agreement with UNDP worth US \$0.7 million on implementing a complex EE program in a town of Prigorodnyi near Astana to be financed largely from the state budget. UNDP, while implementing this UNDP/GEF project, has positioned itself as a well-recognized local entity with unique expertise in EE project implementation, and the government sees UNDP as a credible partner in spreading the energy-efficiency agenda to other regions of Kazakhstan. The follow-up project will test a comprehensive approach to municipal heating for a small urban area, thus proving the sustainability and high replication potential of project results.



Prigorodny village



Yekaterina Paniklova, UNDP Deputy Resident Representative: «Pilot projects in Astana, Karaganda, Almaty and Kostanay tested new approaches to improving energy efficiency in the residential sector that later made their way to the national program on modernization of the residential sector and contributed to development of important policy and legal documents on energy efficiency including the Law on Energy Saving and the Comprehensive Plan on Energy Efficiency».

Moreover, the Ministry of Regional Development is currently formulating a strategy for regional development that will fully adopt the project's approaches to energy efficiency in district heating and hot water supply, leading to nationwide replication of the project's results.

Given the diverse and decentralized nature of the municipal heating sector and its stakeholders – from large-scale district heating companies and local municipalities to single apartment owners and tenants – the government is recognizing that an effective outreach and education campaign that reaches throughout this expansive range of players is essential to the success of policies. And the UNDP-GEF project should be fully credited for successful promotion of a strategic and multi-tiered approach to outreach, education and training that leverages a variety of partners and resources, as well as to the public exposure and media attention to energy efficiency.

4. Lessons learned

The UNDP/GEF project generated a large number of best practices and lessons learned available for scale-up and replication at the national and local levels. The GEF grant financing was particularly critical in having the government enter this largely “virgin” terrain of public policy on energy efficiency in district heating and hot water supply, and approach this issue in a comprehensive manner.

Early movers always have the difficult job of overcoming unforeseen challenges and working through obstacles to arrive at the best practices. By sharing these lessons, the UNDP/GEF project arms policy makers and implementers with a roadmap to more effective energy efficiency policies in district heating and hot water supply – and in other areas as well.

Creating political will

The government needs to provide leadership in addressing energy efficiency in district heating and hot water supply through a series of low-cost, high-impact actions, thereby informing, engaging, and motivating other stakeholders.



Marina Olshanskaya, UNDP/GEF Technical Adviser for Europe and CIS: «The UNDP/GEF Project revealed the enormous potential for energy efficiency and conservation in the country when addressing non-financial barriers of legal and regulatory nature. And political commitment to energy efficiency from the top down, as the UNDP/GEF Project learned, proved to be of utmost importance for the energy efficiency agenda to materialize and succeed in Kazakhstan».

A multi-tiered approach to lobbying for legal and policy changes

The UNDP/GEF project proved the effectiveness of a multi-tiered and multi-stakeholder approach in pushing the energy-efficiency agenda forward. Talks at high-level meetings, all-inclusive public hearings, participation in conferences and government meetings, engagement of parliament deputies and hand-in-hand work with the government administrator on adoption and enforcement of the energy-efficiency law, a study tour to Poland for key decision-makers in the government and members of Parliament – all these steps represent a non-exhaustive list of ways that the project influenced and shifted the focus of government policies.

Bottom up vs. top down approach in policy making

Bottom up policy making still remains a common practice in the country despite the on-going efforts of the government of switching to locally driven policy making and implementation. The UNDP/GEF project piloted a comprehensive bottom-up approach to the development of regional energy-efficiency plans/programs that first considers priorities and expectations of different stakeholders related to energy efficiency and only then formulates a goal and objectives of the program/plan with clear indicators for tracking its implementation. This approach proved to be cost-effective and responsive to the needs on the ground.

There is no end to the need for capacity building

This particular lesson learned is closely linked to the bottom-up approach in development and implementation of EE policies and measures. Without locally available expertise and knowledge the government would fail to implement any of its energy-efficiency policies on the ground. At the same time, the national government should understand the real needs and capacities of local stakeholders, including the general public. The UNDP/GEF project has witnessed an enormous need for systemic capacity building that should be an integral part of national and regional programs on energy efficiency.



Ainur Sospanova, Head of the Department of Green Technologies and Investment, MEP, GEF Operational Focal Point: «Coming from inside the government, I see an enormous need for systematic capacity building of and information sharing among government officials and employees to ensure effective planning and implementation of public policies on energy efficiency and conservation. And this work has been at the core of the UNDP/GEF Project!»

Active and dedicated partners are critical for sustaining progress and results

The project greatly benefited from dedicated and active partners in the government, among private sector companies and AAOs. These partners now equipped with the requisite skills already implement EE projects on the ground and push for the energy-efficiency agenda in their localities. The very existence of such committed and enthusiastic partners on the ground is half the battle in attaining the sustainability of proposed interventions.

A new approach to information provision & awareness

The public's general environmental ignorance and low awareness of social and economic benefits of energy efficiency can constitute a major obstacle to widespread introduction of energy-efficient measures in Kazakhstan. The project introduced an easy-to-use infographic tool, which conveniently and effectively conveyed key messages and results of pilot projects, financial schemes piloted by the project, etc. in a clear and non-technical manner. The government now builds on this positive experience and proliferates the use of infographics in its work, e.g. in explaining the usefulness of the PMMHI.

5. Looking ahead

Kazakhstan has significant potential in energy efficiency and conservation. The government's priorities include the reconstruction and modernisation of existing power plants, with a particular emphasis on fuel switching from coal/oil to gas and boiler and turbine efficiency. Another area of potential energy saving is reduction of energy losses through transmission and distribution, where electricity losses are estimated at 10 to 15 percent and heat losses are as high as 50 percent. According to the Kazakhstan Electricity Association, the potential for energy efficiency in Kazakhstan is estimated at 30-35 percent of current consumption levels. Thus, energy efficiency has significant potential to cost-effectively reduce the projected increase in energy demand and requirement for additional supply.



Stanislav Kim, Head of Energy & Environment Team, UNDP Kazakhstan: «By approving the construction of a new power station, the government takes a conventional approach to energy sector development, which is ineffective. The government needs to have a more comprehensive approach to assessing available alternatives. What is more cost-effective, for example, to build a new power station or upgrade & retrofit existing facilities and infrastructure? Financing energy efficiency does not solely come down to replacement of pipes and retrofit of the existing building stock. Rather, it is an investment into the country's future competitiveness. In this regard, the President's recent call for a 'green economy' development path puts energy efficiency at the forefront of the government's agenda».

The successful implementation of the UNDP/GEF project has been a major but only a first step towards more energy efficient Kazakhstan. There are many others to follow. **Key recommendations for moving forward include the following:**

- As private companies are still reluctant to enter the energy services market due to high investment risk, the government should consider the creation of a municipal energy service company (ESCO), as an alternative. Testing this model will generate practical results and on-the-ground experience on ESCO creation and operations, which are lacking at the moment, which can be used for amending existing and formulating new policies to speed up private ESCO activities. The project did lay foundations for sustainable replication and implementation of energy efficiency services under commercial terms, and also with financing from public sources to achieve higher energy and greenhouse gas savings. The government should be forward-looking by creating favourable conditions for private and public investments in energy efficiency.



Gennadiy Doroshin, Technical Adviser of the UNDP/GEF Project: «The government needs to adopt a free-market approach to heating and hot water supply if this sector is to ever attract private investments for reconstruction and upgrade».

- Despite the success of the project, there is still a long way to go to fully utilize the energy efficiency potential in district heating. Heat tariffs are still low and do not cover full costs. Thus, district heating does not attract private capital and energy

efficiency improvements rely heavily on subsidies from public budgets. To shift this financial burden to the private sector, the government should consider a phased approach to restructuring the tariff policy up to a level of full-cost recovery. The project's pilot proposal for Kostanay district heating company that focuses on technical improvements of the supply side can come in handy and be used to protect customers against rising gas prices. Importantly, this government work should go hand-in-hand with creation of relevant social support schemes to extend adequate support to low-income sectors of the population.

Natalya Druz, Social expert of the UNDP/GEF Project: «While the UNDP/GEF Project targeted efficient use and conservation of heat and hot water in residential and public buildings as a way to primarily reduce greenhouse gas emissions in the country, it diagnosed and unveiled a lot of social issues at a building level that demand attention and need to inform next rounds of policy amendments and implementation on the ground».

- The Program on Modernization of Municipal and Housing Infrastructure is a timely policy effort on part of the government that aims at promoting energy efficiency in the housing sector. But as with any other policy, it is a work-in-progress framework and, to make it workable, the government should put forward an adequate monitoring system. A system should serve the purpose of creating a unified database of completed retrofit projects including a menu of realized measures, costs, effectiveness and barriers addressed during implementation. The monitoring protocol developed by the project can be well used as a tool to track effectiveness of such projects. With more experience on the ground, the monitoring system will become a “depository” of generated lessons learned and experiences of the Program that can inform subsequent rounds of policy adjustment. Also, it will help create a menu of management actions that program administrators on the ground can easily access and apply. Finally, it will contribute to the government's ongoing work on energy efficiency monitoring and rating of residential buildings.



Toleutai Rakhimbekov, Chairman of the Board of the Kazakh Center ZhKH: «There is no such thing as the energy surplus, and we have none in our country. This means that each and everyone of us should learn how to save energy so that released power generation capacities can be used to meet the needs of a growing domestic economy including new industries and jobs».

- The government would benefit from economies of scale by adopting a practice of municipal energy saving planning following the pilot examples of Astana, Karaganda and Pavlodar. Recommendations of the UNDP/GEF project on planning and execution of energy saving plans will guide municipalities in this new endeavor. The planning process itself will assist municipalities in having a complete picture of available generation capacities, current and future energy demands for sustainable development of a city's economy as well as possible alternative energy uses.
- Finally, capacity building of AAOs and managing companies should be at the core of public policies in the housing sector. It is crucial that competent people manage communal property to ensure effective implementation of relevant government policies.

District Heating in Kazakhstan (reference information)

District Heating in Kazakhstan Municipal heat supply sector in Kazakhstan is an integral social issue and a public good, necessary for life activity considering the inclement climatic conditions in Kazakhstan. District heating (heating of residential and public buildings) systems in Kazakhstan are based on district heat supply networks (DH) at the CHP plant with the combined heat and power production (cogeneration based district heating) and large district boiler houses widespread in Kazakhstan (all cities). It is well known that the district heating sector is a complex sector consisting of a CHP plant (or the district boiler house), heat supply networks and heat consumption systems. By 2012, 42 district heat supply networks (DH) operated in

30 cities of Kazakhstan based on 40 CHP plants of 6700 MW and 29,000 Gcal/h production capacity and about 30 large boiler houses of 5000 Gcal/h capacity. DH with the combined heat and power production (cogeneration based district heating) at the CHP plant provides 43% of the heat consumption in the cities and a third of the country's power consumption. District heating system based on CHP plants is mostly developed in the northern region of Kazakhstan - 64% of the total available heating capacity of CHP plants in RK; in the southern regions, the heating capacity of the DH system based on CHP plant is 19%, and 17% in the western regions.

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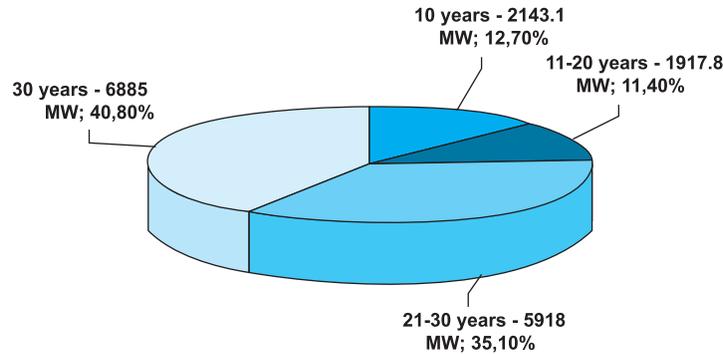
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Heat sources:

Existing combined heat and power plants (CHP plants) of Kazakhstan were mainly built in the 60-80's of the last century. From 1990 through 2010 capacity commissioning at the CHP plants had been limited. Given the length of the heating season in Kazakhstan, upgrading and further development of the existing district heat supply networks are not only advantageous, but should be considered as the most important priorities.

Age of CHP plant generating equipment



The current technical condition of a district heat supply from regional boiler houses of various types of ownership of the capacity over 100 Gcal/h shows that these systems in most cases have low competitiveness compared to a decentralized heat supply system, mainly because of poor conditions of heat supply networks and, to a lesser extent, due to physical wear-and-tear of boilers. Total heating capacity of most regional boiler houses in the cities and towns is higher than the connected heat load. This allows wherever possible to meet the demands of the population in heat and hot water. However, these opportunities are getting less and less every year. If economic benefits of combined heat and power energy production are ensured by fuel saving, the benefits of district heating from regional boiler houses can be implemented only under conditions of high boiler house efficiency factors, high operational reliability, durability of heat supply networks and the low heat loss rates.

Heat supply networks

Kazakhstan DH heat supply networks are insufficiently reliable engineering structures; the number of annual faults is several times higher than in Western Europe. Increased number of failures is due to the use of outdated installation technology and accumulated in the years of crisis, the lag in replacing networks and capital repairs. About 70% of the total length of heating pipelines is over 20 years old with a standard service life of 25 years. The main type of thermal insulation is a mineral wool in non-hermetic containment comprised of different materials. With the penetration of moisture into the channels, the mineral wool quickly becomes wet and loses its insulating properties. Currently, the predominant part of DH heat supply networks has a poor condition of insulation and significant leakage through worn valves and seals, which is a major cause of excessive loss of heat and heat carrier. Reliable information on the heat loss during the heat transfer cannot be obtained, as in most cases there are no meters at the borders of the transit and distribution networks. According to expert evaluation, up to 20% of the total losses fall on the main transmission networks, and up to 80% on the distribution networks.

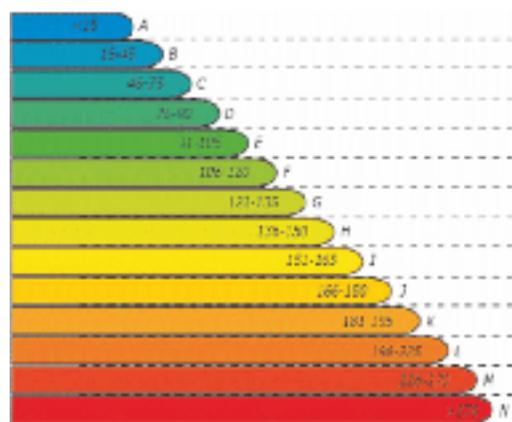
Heat loss in the networks Specific damage rate of heat pipelines is currently high. For instance, in Pavlodar city it is over 80, in Karaganda - more than 550 faults recorded per every 100 km of heat supply networks. Average wear and tear percentage of the heat supply networks in the Republic is estimated at 60-80%. The total length of DH heat supply networks is over 12,000 kilometers. The length of the main heat supply networks (Dy over 300 mm) is 3,6 thousand km (29<SMILE>id=428 alt=':В изнеможении:'</SMILE>. The length of the distribution heat supply networks (Dy less than 300 mm) is 8, 7 thousand kilometers (71<SMILE>id=428 alt=':В изнеможении:'</SMILE>. In recent years, the majority of work was done on the reconstruction of existing heat supply systems. New construction takes place primarily in the city of Astana, where the length of the main heat supply networks in recent years has increased by more than 50 km. Completed construction of transit pipelines in

Almaty connecting CHP plant-2 - CHP plant-1 is of a length of approximately 15 km. Active implementation of trenchless piping work (pipe pushing method) had been started during the reconstruction and new construction in the cities of Astana and Almaty. Pumping stations have modern pumps equipped with frequency-controlled devices; implemented are high-density shutoff and control valves and lens compensators. In other cities, implementation of a new heat supply network piping work technology is in the initial stage.

Heat consumption systems

Conversion of the heat sources to the required heat and hot water temperatures is being done at the central heat substations (CHS) for a group of buildings and at the individual heat substations (IHS) for consumers at the building level. These systems provide a heat supply to the multi-storey buildings of the housing and public utility sector (HPUS) of these cities, the bulk of which goes to the buildings built in the twentieth century (mainly between the 1960s and 1990s). Heat supply systems of the older buildings, which are still the majority, are connected to the heat supply networks through the mixing devices - elevator units. Only the multi-storey buildings constructed during the last decade use automated IHS (AIHS) equipped with pumps instead of the water-jet elevators.

Specific heat rate in the buildings



Kazakhstan - about 243 kWh/m² (in accordance to IEA)

Existing district heating networks use the temperature adjustment methods (depending on weather conditions) centralized at the heat source. Heat carrier temperature changes at a fixed-flow in heat supply networks (so called - quality controlled system). The most widely used temperature setting is 150/70°C. In the 1990s there was a noticeable drop in the heat loads of industrial consumers of heat energy, and the temperature settings had been reduced to an acceptable hydraulic level in existing heat supply networks.

Some DH networks reduced the temperature settings down to 95/70°C, and stopped using elevator units.

A quality governing method allowed using the simplest and inexpensive heat substations, heat and hot water supply systems in the buildings with a minimum of the simplest automatic devices. Practically no substations are equipped with automatic devices (other than mixers-elevators working at the temperatures above 95/70°C). In Soviet times such technology allowed minimizing investment, and low energy efficiency of heat consumption compensated by the low cost of fuel and energy. Dependent consumer connection method became the most prevalent, and independent systems are only used for buildings higher than 12 floors.

DH uses two systems of hot water supply (DHW) -Open (water intake is from the heat supply network) and Closed (the water is heated in the boilers or heat exchangers). DHW systems for each city are selected considering the discharge capacity of the municipal water supply system to the buildings connected to the heat supply networks and the quality of tap water.

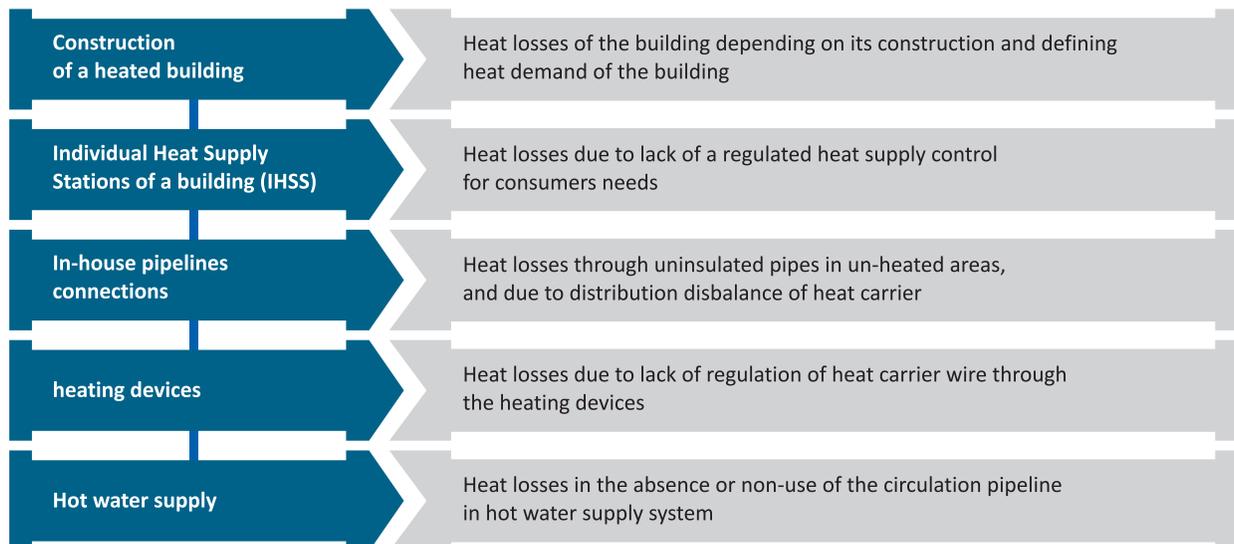
Open DHW systems are functioning in Almaty, Kostanai, Karaganda, Zhezkazgan and other cities. Closed DHW systems operate in Astana, Pavlodar,

Shymkent, Ust-Kamenogorsk, Semipalatinsk and other cities. Normal operation of the elevator shall be subject to the temperature schedule adopted in the period of the break point in the fall and spring to temperatures in the supply pipeline corresponding to the design ambient air temperature for the heat supply. At the beginning and at the end of the heating season, when external temperatures are higher than the break point set in the temperature chart, fixed elevator cannot change the mixing ratio, which leads to «overheating».

Amendment to existing regulations of the RK prohibits the use of elevators and stipulates their replacement with low-noise adjustable pumps capable of eliminating all elevator deficiencies. In modern conditions, the lack of the simplest procedure for water mixing automation and control system from the supply and return piping to ensure hot water normative based temperature level in open systems, leads to the hot water supply only from the supply line with a temperature level from 70 to 95 C°, which makes it difficult to maintain hydraulic modes and is a violation of existing regulations. This reduces the power generation on heat consumption at the CHP plant, which leads to increase in power production in condensing mode and consequently, excessive fuel consumption.

Lack of regulatory automation in IHS and unqualified adjustment of heat supply networks, in combination with the constructional heat storage capacity of the buildings, make the heat consumption systems of HPUS in the cities of Kazakhstan the main energy saving and energy efficiency «reserve storage» of the district heat supply networks.

The reasons of consumers' heat losses in operating DH system





Insulation of the buildings will actually reduce consumers' heat load and free up the heat capacities on the heat sources for connecting new customers. Potential energy saving from insulation of the buildings according to the published studies is estimated at the average of 25%.

Automation of heat and hot water supply systems in buildings will increase the energy efficiency without reducing the heat load, and the annual heat consumption will be reduced by 10-20%.

Heat loads for privately owned apartments in residential buildings must be ensured by the heat supply organization by means of temperature and heat consumption parameters set in accordance with contractual terms and conditions.

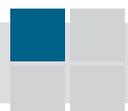
However, the vast majority of residential buildings do not have energy certificates and are not equipped with heat consumption meters. However, heat consumers cannot control the performance of contractual obligations of heat supply organizations and hold them accountable for the breach of a contract.

Apartment owners do not have sufficient knowledge, financial or organizational capacity for collective problem-solving related to residential heat supply systems.

In matters of heat consumption, the common thrift cannot often find the application. The main reason for this is the lack of technical possibilities in the hands of consumers (except for reducing the heating temperatures from overheating by opening windows) allowing them to manage their own heat consumption. In addition, consumers of heat energy in the buildings have no real incentives for reducing the heat consumption.

The real potential of DH energy efficiency here could be evaluated as 5,0 million tons of standard fuel, which is about 30% of the actual fuel consumption in the DH:

- by increasing the share of electricity production in the heat consumption in CHP plant, the annual fuel saving will make 2,0 million tons of standard fuel;
- by reducing heat losses in the heat supply networks, the annual fuel saving will make 1,5 million tons of standard fuel;
- by implementing the energy conservation measures into the heat consumption system, the annual fuel saving will make 1,5 million tons of standard fuel.



Project one-pager



Inefficient municipal heat and hot water supply systems in Kazakhstan should be upgraded to reduce greenhouse gas emissions

Main Beneficiary:
Ministry of Regional
Development

Project duration:
2007 - 2013

Project budget:
GEF - \$3,290,000

Expected co-financing:
Government – \$130 000



The Project «**Removing barriers to energy efficiency in municipal heat and hot water supply**» is aimed to remove barriers to energy efficiency in municipal heat and hot water supply systems in Kazakhstan and to lay the foundation for the sustainable development of these services taking into account local as well as global environmental considerations.

Expected results of the project:

- A supportive legal and regulatory framework in place to promote and provide incentives for the improvement of the energy efficiency of the heat and hot water supply services in Kazakhstan, including, as applicable, specific incentive and other mechanisms to encourage the effective implementation and enforcement of the adopted laws and regulations by the key stakeholders;
- New institutional and financing models introduced for leveraging financing for EE investments and enhanced capacity of the local stakeholders to support their further implementation and replication
- Compilation, analysis and dissemination of the project experiences and lessons learnt and initiation of their effective replication in Kazakhstan and other CIS countries/municipalities with comparable situation.

Partners in action:

- Ministry of Environmental Protection
- Ministry of Industry and New Technology
- Agency of the RoK on Regulation of Natural Monopolies
- Akimats, incl. of Astana, Almaty and Karaganda cities
- Kazakhstan Housing and Utilities Sector Reform Center JSC
- Local communities and non-governmental organizations
- Scientific research institutes
- Business-companies of a heat supply and energy efficiency

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Phone/fax: +7 (7172) 901636, 901637, 901638
www.eep.kz

KEY PROJECT PARTNERS:

Ministry of Regional Development of the Republic of Kazakhstan – National Project Implementing Agency

Ministry of Environmental Protection of the Republic of Kazakhstan – official Project Partner

Ministry of Industry and New Technologies of the Republic of Kazakhstan – official Project Partner

Ministry of Economy and budget planning of Republic of Kazakhstan – official Project Partner

Agency for Natural Monopoly Regulation of the Republic of Kazakhstan – official Project Partner

Astana Akimat



Cooperation on approbation of revolving financing mechanism for energy efficiency in multiapartment buildings
www.astana.kz

Astana-Teplotranzit JSC

Assistance in technical and organizational issues on promotion of energy efficiency in Astana heating sector
www.a-tranzit.kz

Almaty Akimat



Cooperation on approbation of revolving financing mechanism for energy efficiency in multiapartment buildings
www.almaty.kz

Almatinskije Teplovyje Seti LTD

Assistance in technical and organizational issues on promotion of energy efficiency in Almaty heating sector
<http://www.alts.kz>

Akimat of Karaganda oblast



Cooperation on approbation of revolving financing mechanism for energy efficiency in multiapartment buildings
www.karaganda-akimat.gov.kz

Karagandyzhylusbyt LDT

Assistance in technical and organizational issues on promotion of energy efficiency in Karagandy heating sector
<http://www.zhylu.kz>

KEY PROJECT PARTNERS:

JSC "Kazakhstan center for Modernization and Development of Housing and Utilities" Assistance in promoting energy efficiency proposals in the field of housing relations, Housing Infrastructure modernization and development programs
<http://zhkh-center.kz/>



Association of Legal Entities (ALE) "National Housing and Utilities Chamber" Assistance in promoting energy efficiency proposals in the field of housing relations, Housing Infrastructure modernization and development programs, PR-campaign on energy efficiency in the HI sector.
www.palata.zhkh.kz



Consortium of Astana AAO "Baiterek" Cooperation on approbation of energy efficiency fund for AAO and implementation of Astana pilot projects
<http://frc.kz/1032599-bayterek-gorodskaya-assotsiatsiya-ksk.html>

SIF Ergonomika LTD

Cooperation and technical advisory support on energy efficiency issues in heating sector. Implementor of ESCO Model in Karagandy
<http://www.ergonomika.kz>

ENCOM-ST LTD

Cooperation and technical advisory support on energy efficiency issues in heating sector. Cooperation in implementation of pilot projects in Astana administrative buildings
www.enkom.kz



"KazNPIEnergoprom" Institute JSC Assistance in assessment of the national energy efficiency capacity and technical advice on energy saving issues
www.knep.kz/institut



Union of legal entities «KATO» Assistance in assessment of the national energy efficiency capacity and technical advice on energy saving issues
<http://kato.kz>



Consortium of Almaty AAOs Assistance in promotion of in-house property management and implementation of Almaty pilot projects.
64 Buharzhayrau Boulevard, Almaty, phone: +7 (717) 2753211, 2753212;

Danfoss LTD

Technical assistance on implementation of demonstration projects. Consulting support on promotion of energy efficiency in heating sector
<http://kz.heating.danfoss.com>



Energy Company Ltd Technical assistance on implementation of demonstration projects in Almaty.
<http://www.enko.kz>



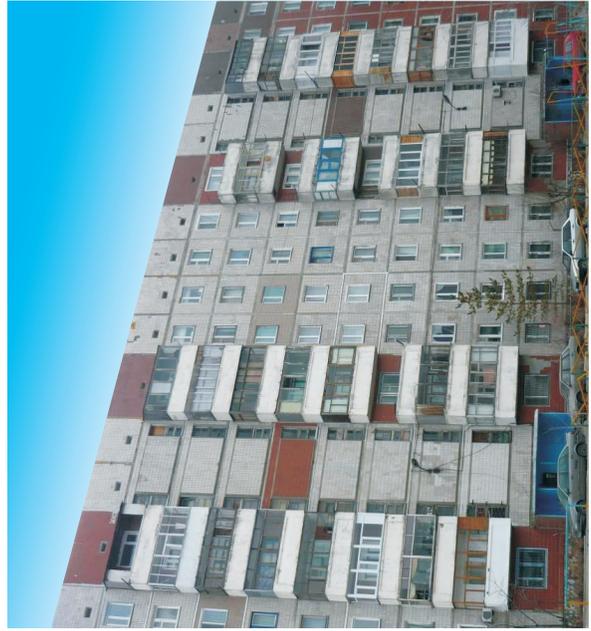
Key lessons learnt and recommended actions for the pilot area - Karaganda city

KARAGANDA PILOT

DEMO PROJECT UNDP/GEF

in residential building CAO "Chingiz"

In 2009, for the first time in Kazakhstan, with the support of UNDP and Akimat of Karaganda region in Karaganda city, a private ESCO company was established on the basis of LLP NPC "Ergonomics".



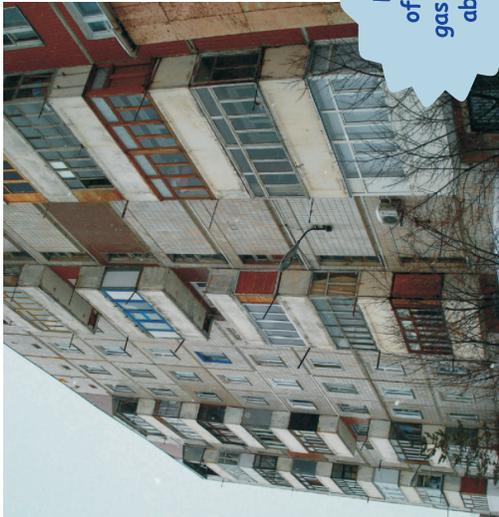
THE PILOT PROJECT IS AIMED to demonstrate the reduction of heat energy consumption in the residential multiapartments as a result of installation of automatic control heat current system and organization of corresponding heat metering for effective heat consumption management in the building.

Previous situation:

-  No heat energy metering device;
-  Connection of the HWS circuit (hot water supply) to the centralized heat network was made in accordance with the open deadlock scheme;
-  Water circulation in the hot water supply system was not provided;
-  The installed equipment did not allow to regulate the distribution of energy resources for needs of heating and hot water supply.

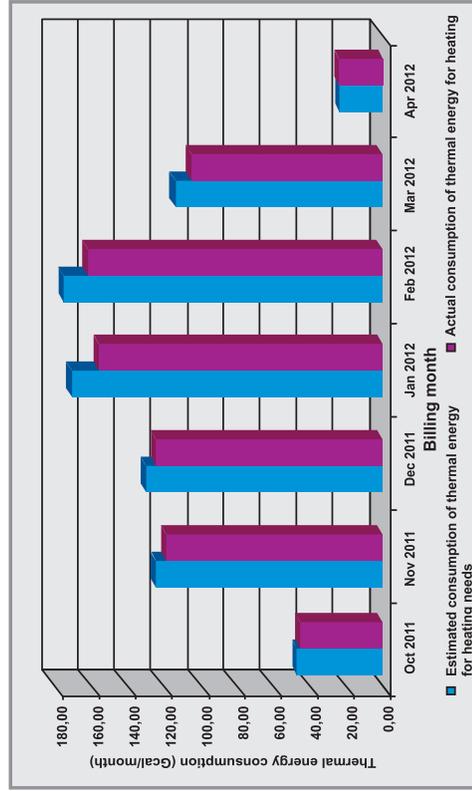
Current situation:

-  Full reconstruction of the heat unit;
-  Installation of the automatic system of heat consumption regulation;
-  Replacement of a heat-exchanger;
-  Installation of the heat metering devices;
-  Replacement of control and lock-up valves.



Prevention of greenhouse gas emission was about 45 tons of CO₂

Comparative analysis of heat energy consumption in residential multiapartments at mkrn. Stepnoi-4, h. 8 (Chingiz AAO) for heating season 2011-2012.



ESCO model

ESCO is a company that provides energy services: conducts energy audit, develops energy saving project, finances it, manages adaptation, monitors received energy savings, operates and provides installed equipment.

Chart of monthly actual heat payments made by apartment owners for heating needs in residential multiapartment at mkrn. Stepnoi-4, h. 8 (Chingiz CAO) compared with normative heat payment for Karaganda

№	payment	January	February	March	April	October	November	December
1.	In accordance to heat meter, tenge/m ²	77,1	77,1	77,1	37,3	48,83	68,98	69,9
2.	In fact, tenge/m ²	92,84	76,83	63,01	14,78	19,43	57,28	76,38
3.	Savings, tenge/m ²	-15,7	0,3	14,1	22,5	29,4	11,7	-6,5

TOTAL SAVINGS

of heat payments from operation of heat saving equipment for 1 year amounted **411 thousands tenge**

CAPITAL COSTS

Project amounted **3,1 millions tenge**



“Karagandy Consulting Center for Heat Consumers” (KCCHC)

The purpose of KCCHC is to increase the role of building owners, CAO and residents CSC management heat consumption and increase awareness of ways and methods of improving energy efficiency in buildings.

The main results of the Center's work:

- 12 training seminars;
- 4 conferences on energy efficiency;
- Conducted opinion poll among the population;
- Created a web site: www.kcee.kz;
- Created a documentary "Energy conservation in Karaganda region";
- Made social banners on the subjects of energy conservation;
- Made public service ads and posted them on the city buses;
- Conducted 4 press conferences for the media on issues of energy conservation;
- Held a competition among the media for the best coverage of energy conservation;
- Issued brochures and flyers;
- Discussed the subject with the media;
- Conducted training on "Effective information management as a key to energy efficiency";
- Conducted a meeting for the media;
- Held a regional exhibition - seminar on "Methods and means of energy saving and housing and communal services of the Karaganda region";
- Assisted ESCO Karaganda in media coverage of the results of the company's work, organization of the work with apartment owners and CAO on the issues of new projects' initiation using the ESCO model.



Key lessons learnt and recommended actions for the pilot area - Karaganda city

Lessons learnt	Possible actions
<p>The need for bringing the Karaganda district heat supply system to appropriate regulatory condition is enormous but there exists no strong demand for energy supply services. The existing maintenance practice of residential buildings allows for deviations from norms in the use of district heat supply systems. This prevents from keeping such systems in order and improving their energy efficiency.</p>	<p>Given the lack of heat energy, the city needs to introduce regulatory measures to increase the level of responsibility of heat consumers and suppliers related to heat consumption standards, condition of heat units and networks.</p>
<p>There is no legal regulation of responsibility for changing heat supply systems, which leads to deregulation of the system and reduction of its efficiency. Working with such systems becomes a problem for ESCO, and EE measures fail to generate the desired effect.</p>	<p>Need to meet the requirements of the Law of the RK “On energy conservation and energy efficiency” in terms of adoption of differentiated tariffs for heat supply systems, depending on the presence or absence of heat meters. It is also necessary to revise the city standards for consumed heat energy, and bring the amount of payment to conformity with the actual amount of consumption (considering specific characteristics of residential buildings).</p>
<p>Existing billing rules based on average heat consumption per square meter fail to account for specific characteristics of buildings thus making energy conservation attractive. As such, a low fee rate for heat consumption at the municipality level and the absence of differentiated tariffs make the benefits from energy efficiency less visible, especially in the case of low-rise buildings.</p>	<p>A need for a well-defined and clear acceptance process for installed AHSs with heat meters in residential buildings; develop and approve clearly defined procedures (algorithms) of payment for provided services between suppliers and consumers.</p>
<p>Acceptance procedure for newly installed heat substations (AHS) is not fully adjusted, as well as payment of communal power consumption (agreements, calculation mechanisms, etc.) – all this complicates the billing process for local water heating stations (LWHS) and automated heat substations (AHS).</p>	

Lessons learnt	Possible actions
<p>Apartment owners do not possess sufficient knowledge in solving technical problems of a heating system in a building. They would rather refuse to implement energy efficiency measures in favor of conventional approaches (water dumping, making changes to elevator nozzle, etc.), which further aggravate the problem of the district heat supply.</p>	<p>Need to raise awareness of heat consumers including the use of social services commissioning through Akimat; develop a municipal program (sub-program of EE regional plan) on raising awareness and potentials of CAOs (management companies); use methodological studies and resources of the Center of Heat Consumers, tested by the UNDP/GEF Project.</p>
<p>Heads of CAOs (Collective Apartment Owners) are generally not motivated in EE in residential buildings. EE process in housing blocks is currently not controlled at all! Pilot projects proved to be beneficial but apartment owners cannot get organised to implement EE measures, and CAO and MC are not interested in improving the situation. This is not regulated by anybody, as everything comes down to free will (same for the program on modernization of the heat supply systems in the housing and public utility sector).</p>	<p>Given the lack of heat energy, the Akimat needs to bring a proposal to appropriate state authorities on changes to the Rules of participation of residential buildings in upgrading housing and public utilities making energy conservation mandatory; finance renovations of a residential building only if EE measures are part of the proposed renovation activities for the building.</p>
<p>Tariffs for heat supply services are inadequate failing to cover full costs of heat suppliers. This makes the district heat supply system unattractive for investment in energy efficiency.</p>	<p>Need to improve the heat management system (for all processes); adopt tariffs covering the costs of heat production and supply, and attract investments for upgrading the system including EE measures.</p>
<p>Private companies are cautious to enter the energy services market given a high-risk investment return (nowadays, this type of business is regulated only by contractual terms; a model that have an investment return from an energy supplying company was rejected, which increases the investment risk). This creates a barrier for the creation and development of ESCOs and performance contracts.</p>	<p>Need to take measures to support ESCO development at a regional level using the adopted energy conservation plan as a basis.</p>

Key lessons learnt and recommended actions for the pilot area - Astana city

ASTANA PILOT

DEMO PROJECT UNDP/GEF

in residential buildings CAO "Ainur"

The Project implemented by CAO "Ainur" in cooperation with "A-San" company and active attraction of owners



The project is aimed to demonstrate the reduction of heat consumption in a residential multiapartment as a result of effective heat consumption control made by the apartment owners

Previous situation:

-  No system for heat metering;
-  No incentives by the apartment owners to save heat energy;
-  Lack of a number of elements in heat automatic equipment;
-  Non-working conditions of heat automatic equipment.

Current situation:

-  Automatic control of heat consumption taking into account an external temperature was provided;
-  Conditions for keeping comfortable temperature in the apartments were provided;
-  Personnel of Association of Apartment Owners were trained to leverage (search) resources (investments) for energy saving;
-  Apartment owners are involved in condominium management with aim to increase energy efficiency of the building.



Prevention
of greenhouse
gas emission was
about 235 tons
of CO₂



Comparative analysis of heat energy consumption
in residential multiapartments at Abylaikhan av., h. 7/1, 7/2 (Ainur CAO)
for heating season 2011-2012

Organizational aspects of the project:

- Association of Apartment Owners "Ainur" created the energy saving fund which accumulates the funds received as a result of heat saving. The amount of funds averages KZT 700-1500 per apartment in a month of heating season. This is that economy which is received as a result of project implementation;
- In March 2011 at the expenses of the energy saving fund the energy saving lamps and sound sensors in the entrances were installed. It did not require additional money collection from the apartment owners.

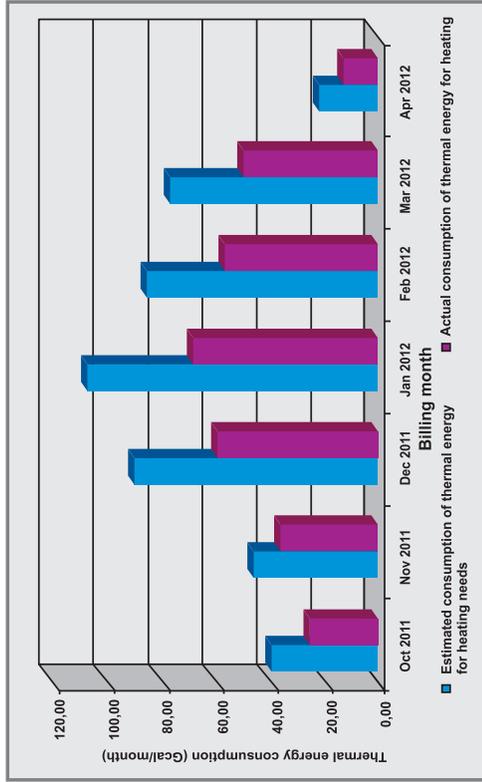


Chart of monthly actual heat payments made by apartment owners for heating needs in residential multiapartment at Abylaikhan av., h. 7/1, 7/2 (Ainur CAO) compared with normative heat payment for Astana

No	payment	January	February	March	April	October	November	December
1.	In accordance to heat meter, tenge/m ²	94,48	89,41	63,91	32,79	34,39	45,65	77,92
2.	In fact, tenge/m ²	70,75	70,18	46,73	27,17	22,18	31,49	51,48
3.	Savings, tenge/m ²	23,73	19,23	17,18	5,62	12,21	14,16	26,44

CAPITAL COSTS

for 2 buildings
amounted

7,6 millions tenge

TOTAL SAVINGS

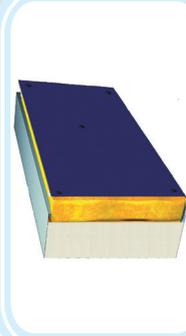
of heat payments
from operation
of heat saving
equipment for whole
period amounted

1,5 million tenge

Pilot project
«Enhancing energy efficiency
of heat supply in the school #9,
Astana city»



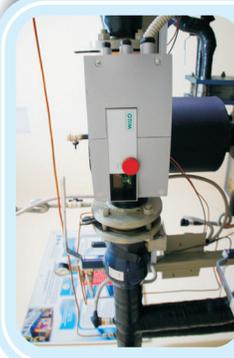
The previously installed external window backs of the building envelope have been insulated and covered by the decorative panels. It will allow to reduce heat losses of the building.



For window backs the insulation used was 50 mm thick. This decision is more effective way to prevent a formation of cracks as it could happen with use of heat insulation of plaster facade which could cause cracks on a place of joint of an old wall and a new plaster layer.



Installation and start-up of the compulsory exhaust ventilation system allowed to solve a problem of the increased humidity in the gym hall which caused the appearance of mold on internal surfaces of the walls.



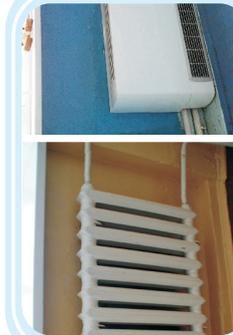
The circulation pump with the frequency drive, installed in the heat system, allows to support continuous difference of pressure in heating system irrespective of its load at any moment.



A renovation of heat point room was made with installation of compartment to divide a warehouse from a place with equipment of automatic heat consumption control system



Installation of balanced valves allows to carry out hydraulic coordination of pipe risers of the heating system, and to exclude underheating and overheating of the system.



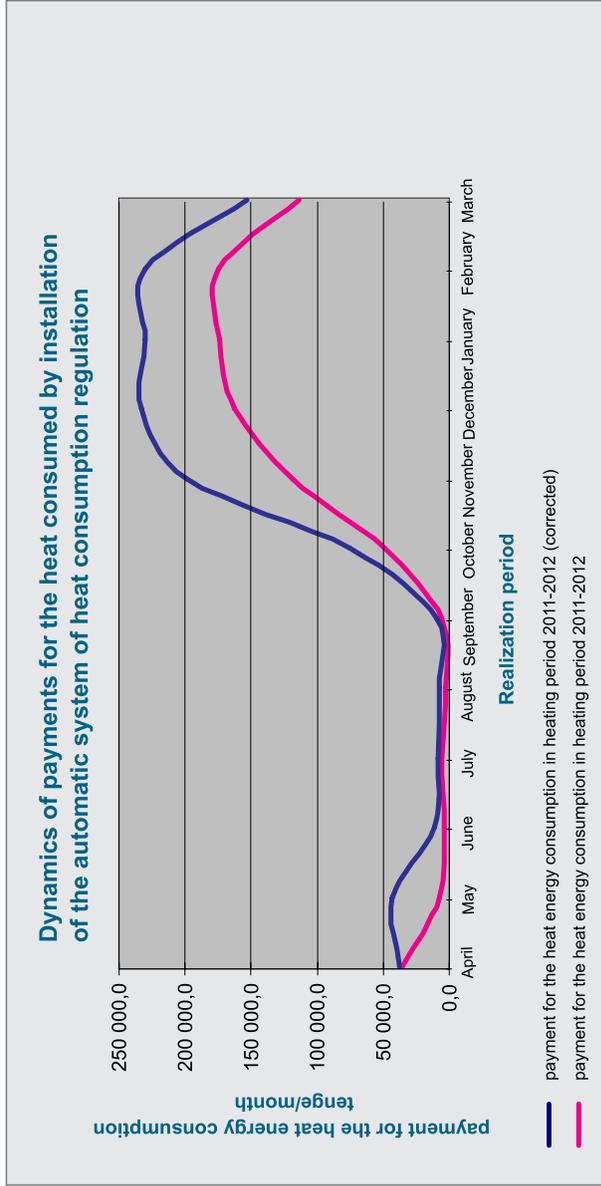
There was a reconstruction of the heating system of the gym hall with replacement of cast-iron radiators with an insufficient heating surface for the fan-coils. The temperature has been normalized. There is a possibility to control the temperature



Demounting and installation of a new heat unit and its commissioning was made within 6 hours.

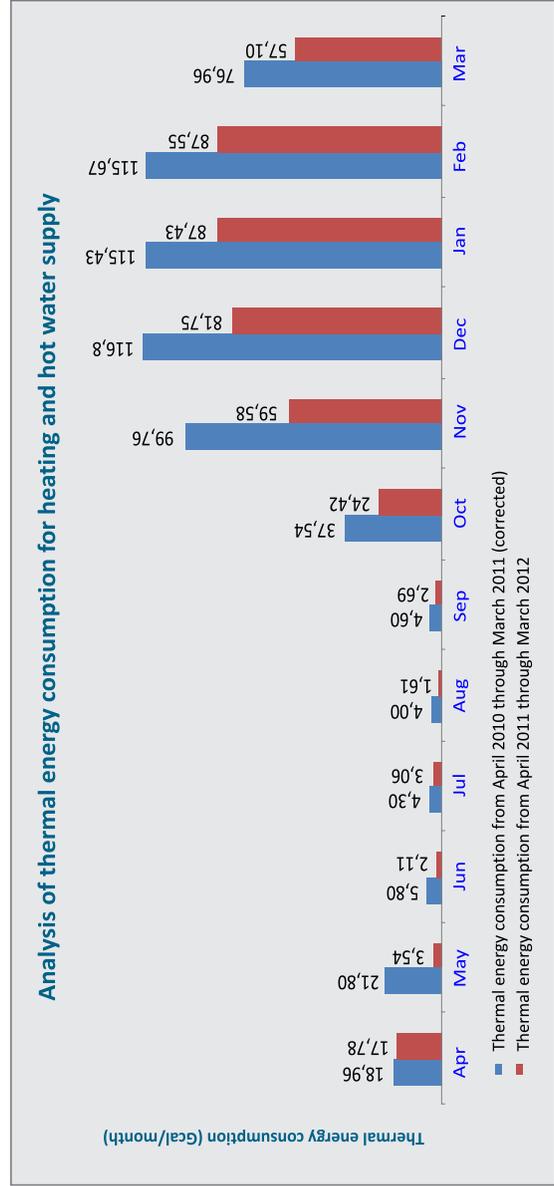
Monitoring results under the project in the school No. 9

SAVINGS
of heat energy
for the period
averaged **31%**



SAVINGS
for payment
for the heat
consumed
averaged
384 518 tenge

Reduction
greenhouse
gas emissions –
82.2 tonnes
of CO₂



Key lessons learnt and recommended actions for the pilot area - Astana city

Lessons	Possible actions
<p>District heat supply systems (especially in old buildings) have undergone significant changes in maintenance (generally outside the project's scope); there is also a problem of incorrect calculation of heat loads for a number of buildings. This complicates the assessment for upgrading heat substations and leads to errors in reconstruction projects.</p>	<p>Need to perform an energy audit of residential buildings: define building types and make a list of priority actions required for different types of buildings; prioritize buildings by the pay-back period and a set of minimal measures.</p>
<p>Astana – is the only city in Kazakhstan where a city norm for heat consumption is adjusted monthly based on actual outside temperature. This justifies the costs for heat consumption for those who have no heat meters. Owners that installed heat meters pay less than those that pay by the norms, and are interested in energy efficiency all year round.</p>	<p>Need to promote the positive experience of Astana to other cities by adjusting local norms to actual outside temperatures thus motivating consumers for energy conservation.</p>
<p>Low level of awareness and experience of CAOs (management companies) in implementation of energy-saving measures, and especially in mobilizing apartment owners – beneficiaries of the projects. Heads of CAO (management company) plays a major role in development and implementation of projects on upgrading of heating systems.</p>	<p>Need to organize effective and affordable trainings for heads of CAOs (management companies), and educate them in effective ways of communication with apartment owners, benefits and mechanisms of energy conservation. Urgently need to improve the "CAO (management company) – Owner" relations in order to raise the CAO's (management company) interest in initiating and implementing energy efficiency measures in building blocks.</p>

Lessons	Possible actions
<p>The lack of interest of apartment owners in energy conservation could be explained by relatively low costs of heat energy (18-25 \$US per 1 Gcal), the lack of binding commitments for heat conservation in buildings (e.g. fixed norms for heat consumption per building), a poorly developed market of energy-efficient technologies and equipment, the lack of energy efficiency consulting market.</p>	<p>A need for strengthening mandatory measures on energy efficiency during renovations of residential apartment buildings financed by the State Program on modernization of the housing and public utilities. This, at the same time, will promote a development of the market of energy-saving technologies and equipment and appropriate consulting services, thus motivating apartment owners.</p>
<p>It is rather difficult to have all apartment owners agree to an energy conservation project.</p>	<p>Effective awareness raising among apartment owners with support from Akimat housing inspectors.</p>
<p>Insufficient responsibility of CAOs (management companies) for installed energy saving equipment in residential buildings</p>	<p>A need for development of an organizational structure ensuring the safety and proper use of equipment (including equipment insurance options).</p>
<p>Discontent on inside temperature levels at the end of the project (overheating can often be observed in apartments before reconstruction; when the project is complete, the temperature in apartments meets the sanitary standards)</p>	<p>Explanatory work with apartment owners focusing on “healthy indoor environment”, insulation of building walls.</p>
<p>A risk of cheaper (but poor quality!) materials used for energy efficiency projects</p>	<p>Introduction of quantitative indicators of energy conservation measures; informing customers of available options; awareness raising among apartment owners; the use of cost and benefit analysis tools.</p>

Key lessons learnt and recommended actions for the pilot area - Almaty city

ALMATY
PILOT

DEMO PROJECT UNDP/GEF

in residential building
CAO "Maksat"

The Project implemented by CAO "Maksat"
with active attraction of owners



The pilot project is aimed to demonstrate the reduction of heat energy consumption in the residential multiapartments as a result of installation of automatic control heat current system and organization of corresponding heat metering for effective heat consumption management in the building.

Previous situation:

- ❶ No heat energy metering device;
- ❷ Connection of the HWS circuit (hot water supply) to the centralized heat network was made in accordance with the open deadlock scheme;
- ❸ Water circulation in the hot water supply system was not provided;
- ❹ The installed equipment did not allow to regulate the distribution of energy resources for needs of heating and hot water supply.

Current situation:

- ❶ Full reconstruction of the heat unit;
- ❷ Installation of the automatic system of heat consumption regulation;
- ❸ Replacement of a heat-exchanger;
- ❹ The personnel has been trained to effectively maintain the in-house engineering communications to prevent prevention heat losses;
- ❺ Apartment owners have been informed about energy saving processes with aim to provide incentives for effective heat consumption control of the building



Prevention of greenhouse gas emission was about 58 tons of CO₂

Comparative analysis of heat energy consumption in residential multiapartments at mkrn. 12, h. 2 (Maksat CAO) for heating season 2011-2012.

Project objectives:

- Increase the qualitative level of heat consumption which lies in providing comfortable conditions in the rooms, and temperature of hot water in accordance with the sanitary standards for household and drinking needs at the minimum energy consumption;
- Flexible regulation of work of heating system and hot water supply;
- Reduction of heat consumption and costs for consumed heat payment

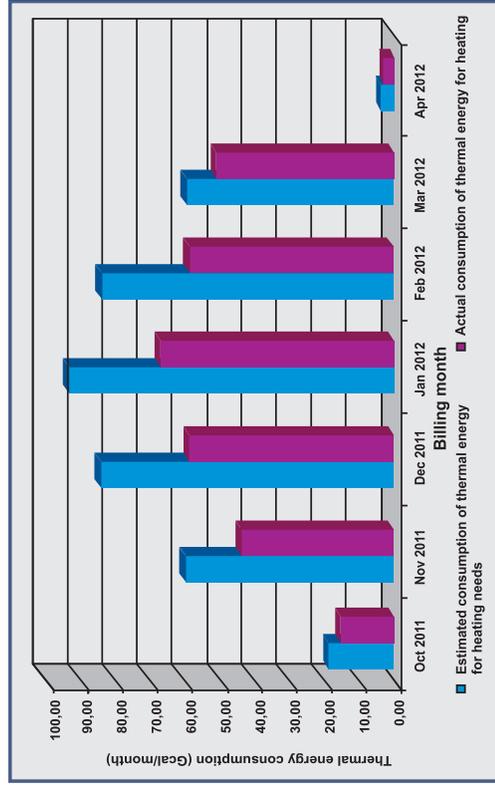


Chart of monthly actual heat payments made by apartment owners for heating needs in residential multiapartment at mkrn. 12, h. 2 (Maksat CAO) compared with normative heat payment for Almaty

No	payment	January	February	March	April	October	November	December
1.	In accordance to heat meter, tenge/m ²	111,11	111,11	89,6	60,9	55,55	111,12	84,9
2.	In fact, tenge/m ²	108,9	112,5	77,2	31,3	25,8	73,4	57,2
3.	Savings, tenge/m ²	2,21	-1,39	12,4	29,6	29,75	37,72	27,7

CAPITAL COSTS

Project amounted
3,1 millions
tenge

TOTAL SAVINGS

of heat payments from operation of heat saving equipment for 1 year amounted
411 thousands tenge

Key lessons learnt and recommended actions for the pilot area - Almaty city

Lessons Learned	Possible actions
<p>It is difficult to find a company that could implement a comprehensive approach to the reconstruction of heat supply units in an apartment building. Usually, one company supplies the equipment, another carries out assembling and installation, and the third company provides O&M. This results in the loss of time for the performer, additional funds to pay for goods, works and services. For these reasons, it is not easy for condominiums (management companies) to implement such projects usually without a highly qualified technical staff in such market conditions.</p>	<p>It is necessary to organize trainings for this kind of engineering companies under the support of Akimat. A good practice would be a creation of a model service company engaged in the design, installation and maintenance of Automated Heat Supply Units for renovated buildings under the needed support of Akimat.</p>
<p>The lack of good experience, even in strong companies, to implement projects for reconstruction of heat consumption systems in existing apartment buildings.</p>	
<p>Market of Almaty companies capable of providing maintenance services (installation of Automated Heat Supply Units) is poorly developed. This leads to high costs of maintenance services and becomes unfavorable to the consumer (in case of a relatively low price for heat energy and small amounts of heat savings).</p>	
<p>Procedures (algorithms) for reconciliation and acceptance into operation of new-mounted heat units (Automated Heat Supply Units) in reconstructed buildings between condominiums (management company) and heat systems are not regulated. Responsibility and procedural issues are not fully specified. All this complicates the process of project implementation in buildings and “keep” the users from energy saving.</p>	<p>To streamline a mechanism for coordinating and commissioning mounted Automated Heat Supply Units with metering devices in apartment buildings, clearly define and approve procedures (algorithms) of relationship between suppliers and consumers of heat energy. Enhance the role of housing inspe</p>

Lessons Learned	Possible actions
<p>Existing rules for providing housing allowances in Almaty still do not promote the smooth inclusion of poor and needy populations in energy saving / repair of the common property of the condominium facility. The procedure for obtaining this assistance is not so simple, especially for the elderly.</p>	<p>It is necessary to improve (simplify and clearly formalize) the process of obtaining housing assistance for this kind of work; devise a comprehensive approach for calculating energy consumption for the purpose of housing assistance in case of the heating equipment upgrade; provide the necessary assistance by social workers for preparing required documents for housing assistance.</p>
<p>It is not resolved who should be engaged in the implementation of EE projects in apartment buildings. Chairmen of condominiums do not want to lead this work; they are not motivated for EE in apartment buildings (payment for the heat is collected from individual accounts of consumers). Condominiums are not involved in energy conservation.</p>	<p>Implementation of UNDP/GEF Model “All payments through condominiums” increases the motivation of an apartment building management body to conserve energy. This model, however, comes with certain obligations and responsibilities for the condominiums management related to heat supply in apartment buildings, including a guarantee of payment. It is necessary to organize trainings for management bodies of condominiums on these issues as well as awareness raising activities among apartment owners.</p>
<p>Apartment owners do not possess sufficient capacity and expertise related to heat consumption in buildings. A sociological research shows that the majority of owners consider only the state to be responsible for modernization of heat consumption systems in apartment buildings (without participation of owners).</p>	<p>To raise consumer awareness about the benefits of heat from the process of thermal modernization (including an increased selling value of an apartment in renovated buildings) through the Akimat’s social programs. To provide information to apartment owners through mass media on the shared responsibility for the condition of a common property of a condominium.</p>

A list of key technical reports

1. Midterm Evaluation Report of the UNDP-GEF Project in Kazakhstan "Removing barriers to energy efficiency in municipal heat & hot water supply". UNDP (2009)
2. Final Evaluation Report of the UNDP-GEF Project in Kazakhstan "Removing barriers to energy efficiency in municipal heat & hot water supply". UNDP (2013)
3. Results, lessons learned and summary of pilot projects of the UNDP-GEF project in Kazakhstan (Astana, Almaty, Karaganda). UNDP (2012)
4. Case Study. Conditions of ESCO development for energy efficiency improvement of municipal heat and hot water supply in Kazakhstan. UNDP (2012)
5. Models of the revolving financing mechanism for energy saving in residential buildings. UNDP. JSC "Kazakhstan Housing & Utilities Sector Reform Center" (2011)
6. Demonstration zone for energy conservation: Pilot projects for energy efficiency improvement of municipal heat and hot water supply. Testing the ESCO mechanism in Karaganda. UNDP (2013)
7. Demonstration zone for energy conservation: Pilot projects for energy efficiency improvement of municipal heat and hot water supply in Astana. UNDP (2012)
8. Recommendations for development of a regional energy saving plan. UNDP (2013)
9. A monitoring protocol for tracking results of energy efficiency projects in buildings. UNDP (2011)
10. Report. Summary of international experience in the development of energy efficiency performance contracts. UNDP (2012)
11. Report on conditions for creation of energy service companies (ESCO) in the sector of the municipal heat and hot water supply in Kazakhstan. UNDP (2012)
12. A monitoring report on the use of heat during the 2011-2012 heating season. AAO «Maksat» in Almaty. UNDP (2012)
13. A monitoring report on the use of heat during the 2011-2012 heating season. AAO «Ainur» in Astana. UNDP (2012)
14. A monitoring report on the use of heat during the 2011-2012 heating season. AAO «Comfort» in Astana. UNDP (2012)
15. A monitoring report on the use of heat during the 2009-2010, 2010-2011 and 2011-2012 heating seasons. AAO «Sary-Arka-7» in Astana. UNDP (2012)
16. A monitoring report on the use of heat during the 2011-2012 heating season in a residential building in Karaganda located in 9 Abdirrov Street. UNDP (2012)
17. A monitoring report on the use of heat during the 2011-2012 heating season in a residential building in Karaganda located in 3A Boulevard of Peace. UNDP (2012)
18. A monitoring report on the use of heat during the 2011-2012 heating season in a residential building in Karaganda located in 41/1 Boulevard of Peace. UNDP (2012)
19. A monitoring report on the use of heat during the 2011-2012 heating season in a residential building in Karaganda located in 26 Mustafin Street. UNDP (2012)
20. A monitoring report on the use of heat during the 2011-2012 heating season in a residential building in Karaganda located in microdistrict 4, building 8, AAO «Chingiz». UNDP (2012)
21. Report. Assessment of the potential for financial resource savings as a result of upgrades in a heat metering system in residential buildings in Astana. UNDP (2012)
22. Report. Economic effectiveness resulting from the installation of a heat metering system in residential buildings in Astana. UNDP (2012)
23. Report. Analysis of approved regional and city-level Rules about the size of and the process for accessing the housing social support scheme during major retrofits with energy-efficiency elements in multi-apartment buildings. UNDP (2011)

24. Report. Analysis of, recommendations and proposals for the draft Comprehensive Energy Efficiency Plan of Kazakhstan for 2012-2015 and the draft law On Energy conservation and energy efficiency. UNDP (2011)
25. Report. Kazakhstan: Restructuring the housing infrastructure and improving effectiveness of the municipal heat and hot water supply. UNDP (2012)
26. Report. Analysis of the tariff policy and regulation, legal frameworks and standards in Kazakhstan to encourage investments in energy efficiency of central heat and hot water supply systems for multi-apartment buildings. UNDP (2011)
27. Report. Summary of experiences from the EU countries and countries in transition related to the tariff policies and regulation, legal frameworks and standards to encourage investments in energy efficiency of central heat and hot water supply systems for multi-apartment buildings. UNDP (2011)
28. Report. Recommendations for the tariff policy and regulation, legal frameworks and standards in Kazakhstan that provide economic incentives for investing in energy efficiency of central heat and hot water supply systems for multi-apartment buildings. UNDP (2011)

A list of key publications and outreach products

1. Reforming housing & communal services and improved energy efficiency (lessons from Karaganda pilots). Video film. Karaganda, 2011.
2. Effective management of multi-family residential buildings as a way forward to energy efficiency. CD with project publications. Astana, 2011.
3. A case study: "ESCO as an instrument for improved energy efficiency". Astana, 2011.
4. A case study: "Energy efficiency in a multifamily residential building as a guarantee for enhanced services of AAOs". Astana, 2011
5. A case study: "Regional planning for energy saving". Astana, 2011
6. Technical solutions for improved energy efficiency in heat supply. Astana, 2010
7. Improving energy efficiency in heat supply: key points. Booklet. Astana, 2010.
8. 10 most widespread delusions concerning installation and maintenance of automatic control system of heat consumption (ACSHC), Astana 2009
9. Basic recommendations for the improvement of energy conservation process planning on the regional level, Astana 2010
10. 1 volume. The improvement of Apartment Owners Association (AAO) opportunities for the increase of residential buildings energy efficiency. General AAO questions.
11. 2 volume. The improvement of AAO opportunities for the increase of residential buildings energy efficiency. Systems of buildings heat consumption and their energy efficiency.
12. 3 volume. The improvement of AAO opportunities for the increase of residential buildings energy efficiency. Everyday reference information for AOC.
13. Models of revolving financing mechanism of energy conservation at residential buildings, Astana, 2010
14. Commemorative booklet, what is necessary to know for the owner of apartment in multistorey apartment house
15. Commemorative booklet, program Competent consumer
16. Booklet Astana citizens, lets stop heating the street!
17. Booklet about the project (in Russian, English). Removing the barriers to energy efficiency in municipal and heat water supply UNDP/GEF project
18. Booklet about the project (in Russian, Kazakh) Removing the barriers to energy efficiency in municipal and heat water supply UNDP/GEF project
19. Cooperation for the purpose of energy efficiency\50.KZ Industrial and innovative Kazakhstan, N6 (12) 2009
20. From the weather at home to solution of global problems of universal importance\50. KZ Industrial and innovative Kazakhstan, N6 (12) 2009
21. Energy efficiency in buildings (AAO+ESCO=ENERGY CONSERVATION) Industrial and innovative Kazakhstan, N6 (12) 2009
22. Energy efficiency begins from every consumer\50.KZ Industrial and innovative Kazakhstan, N6 (12) 2009
23. The application of energy efficient technologies in building sector as the necessary way of progressive development of Kazakhstan// Industrial Kazakhstan, N10 (46) октябрь 2009
24. The experience of Kazakhstan of energy efficiency intensification in residential sector of buildings// Energoaudit N4 (12) 2009
25. The results of the first UNDP/GEF pilot demonstrative projects on energy efficiency increase in building heat supply // Energetics and fuel resources of Kazakhstan, April 10/2
26. Bulletin of the project "Energy-efficiency improvement for communal heat", No.1-4,

2012

27. The course of training of energy conservation and energy efficiency for communal heat. Technical manual for trainers. Astana, 2013
28. Demonstration Zone energy saving: Pilot demonstration project to improve energy efficiency of the system of heat consumption of residential apartment building: testing the model of "All calculations through AAO" - Almaty. – Astana, 2013
29. Demonstration Zone energy saving: Pilot projects to improve energy efficiency building heat systems: testing ESCO mechanism in Karaganda. The Republic of Kazakhstan. – Astana, 2013
30. Demonstration Zone energy saving: Demonstration pilot projects in Astana. Astana, 2013
31. Protocol assess the results of energy efficiency projects in residential and public buildings. Astana, 2013
32. Possibility of achieving social effects through energy efficiency apartment buildings. Astana, 2013

